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MICRO CORNUCOPIA

THE SINGLE BOARD SYSTEMS JOURNAL

April 1983 No. 11

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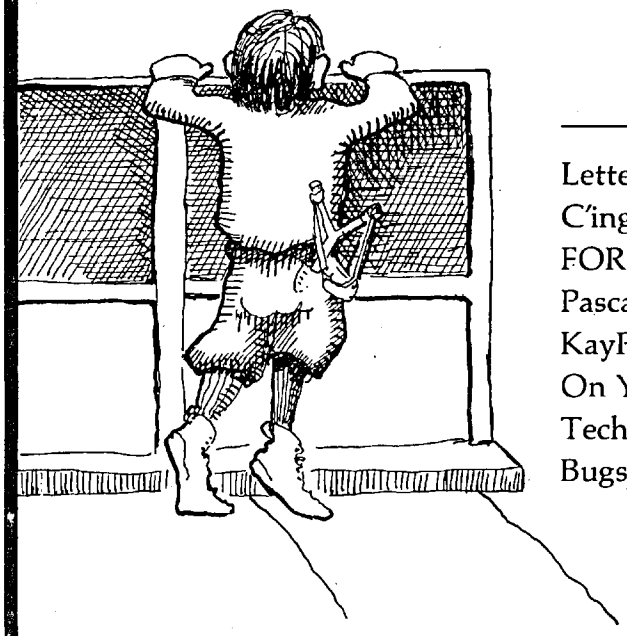

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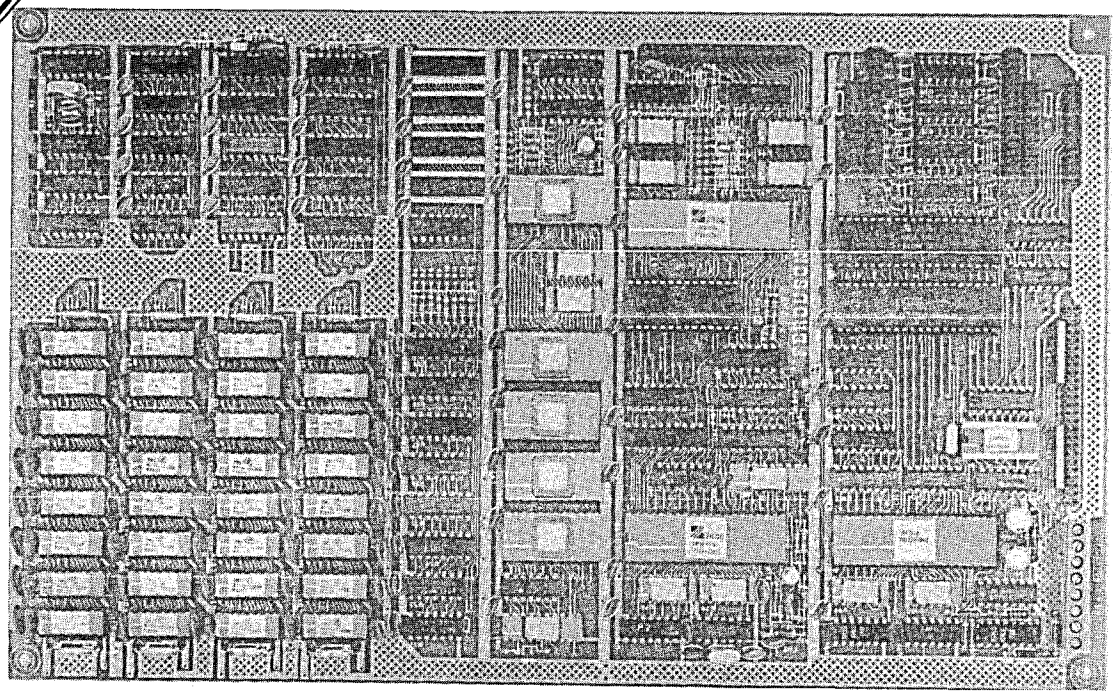

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MICRO CORNUCOPIA

April 1983 The Single Board Systems Journal No. 11

Fairely Flagged!

The Computer Faire

It's hard to be both a participant and an observer but here I am trying to tell you about the West Coast Computer Faire after Sandy and I observed it from the confines of one small booth.

Of course it seems crazy in Bend sometimes with the phone ringing, stacks of mail to be answered, user disks to put together, and a magazine to produce; but the Faire really puts things in perspective.

First of all, San Francisco streets are a good place to find out if you have any insecurities. The two and a half blocks between the show and our hotel were a sort of no man's land of empty shops, porno flicks, and panhandlers. The parking lot attendent suggested that we not leave our little green Honda (Kermit) in the lot overnight because it would be broken into.

Smashing, I thought—where do we keep the car, in the hotel room? Hello, room service? Please send up supper for Sandy and I, plus a quart of your best 10/40 for Kermit. (Anyway, we were fortunate. The Honda was not molested.)

Second, manning a booth means 30+ hours of talking. Actually, the first day we shouted in an attempt to be heard over the din, the second and third days our voices were in no shape to shout.

So it was a crazy time, two weeks getting ready, one day of travel, one day of setup, three days of Faire, one more day getting back to Bend, and then back into the thick of things trying to get caught up.

It was worth going. We were able to put together a lot of names and voices and faces. Also we found out that a lot of people are aware of the Big Board and have considered getting one but didn't know about Micro C. There was also a LOT of interest in the KayPro.

Most of the KayPro folks were not interested in hardware or software details, they were just users. But those interested in the nits and grits were delighted to see the kind of information they could get in Micro C.

We put up a little sign announcing the Saturday meeting of the Big Board Users. We got a larger room than we had last year but we filled it (had more folks than the TRS-80 color users and we were a much more colorful group). I did a rough count and it looked like better than 100. Over 90 percent had at least one Big Board I, 20 percent had Big Board IIs, 5 percent had KayPros, and 2 percent had Xerox's. I know this doesn't add up, but I'm sure you realize that you don't have to be into sports to give more than 100 percent.

The presentation was very impromptu (unorganized) and I spent good a portion of the time sucking on a lemon (to save what was left of my voice).

There were a lot of questions: "What is the history of the BB I, the Xerox, the KayPro, and the BB II?" "What is Bend like?" "Who are you (meaning me)?" "Tell us more about the BB II." "What is the story about the RAM disk?" "Are they ever going to finish the documentation for the BB II?"

Fortunately Bill Siegmund was there to field the BB II questions. I still don't know, however, if or when Cal-Tex is going to finish the manual. I'm going to give you as much BB II information as I can through Micro C but it would be really super if they would come up with documentation appropriate to such a powerful system.

Tony Ozrelic was there to handle the questions about the new RAM (Dyna) disk, so I turned the podium over to him and I went back to sucking on my lemon. He had just installed Dyna on my BB so at the end of the meeting we all adjorned back to the booth to watch my BB play VAX (VAX simili?).

I don't know how many orders he got at the Faire, but he sure had a mob of folks following him about. See my very

(continued on page 26)

LETTERS

Dear Editor,

My BB is running 4MHz. I had problems with the EPROM and with the 74LS04 in clock generator circuits (video & system). I replaced them with 7404.

The second problem I had with floppy drive SA901. It was an error in the index circuit. I found the error in four hours without an electric scheme.

Now I am building a box from wood for the BB and floppy drive.

In December I received JRT PASCAL! It is very good.

In software I made simple assembly programs for copying programs using a single drive, and made a calculator in Pascal. In future I shall make screen editor in JRT Pascal.

At the end I must write: 1. BB is the best. 2. Micro Cornucopia is very good. 3. I am happy.

I hope that you understood all. My English is not well.

Martin Mali, Dipl. Ing.
Borovnica Blok-7
61353 Borovnica Yugoslavia

Editor's note:

Don't apologize for your English, Martin. It is very well indeed. And definitely keep Micro C in mind when you have your text editor running. It sounds most interesting.

Dear Editor,

Here's the promised update on Siemens drives. I talked with a sales rep from a distributor and was told that Siemens had installed faulty DC stepper motors in several thousand of their FDD 100-8 (8" SS/DD) disk drives before they found out the motors had a short life span.

Instead of replacing the motors, they decided to call it a loss and dump the drives on the surplus market instead of trying to pass them off on their regular OEM customers. Not to worry though, the life span of the motors is probably sufficient for most anyone's purposes, since 'short life' refers to 'industrial' standards (I don't think I could get a couple of thousand hours of operating time out of a stepper motor even if I played Adventure 24 hours a day!).

There is some truth to the rumor that Siemens is getting out of the drive market. I was told that Siemens had sold their drive operation to a place called International Storage Technology (or something like that). No one seems to know yet whether or not it will change names, but the drives will go on. (Until the stepper motors quit.)

Two more notes that may be of interest:

First, anyone interested in the Dvorak keyboard layout can find an article in the history and a picture of the layout in the June 1980 issue of *Phi Kappa Deltan*, pp. 671-3. I have set up my keyboard this way and I have to agree, it is quick to learn and easy to use.

Second, if you have had difficulty locating a solid state relay for the time-out on the disk drive AC motors (Micro C, Sept. '81, p5), then write or call

ITT Components
3201 S. Standard
Santa Ana, CA 92707
(714) 751-3900

for a distributor in your area. The price is about $8.50 each.

Darren Hiebert
1188 Masselin Ave.
Los Angeles, CA 90019

Dear Editor

I can implement double density but I need help with the software. If anyone is willing to do the software, I would be willing to share the hardware design in an article.

I am also working on a disk interface with DMA, 256K RAM conversion for CP/M plus, NEC 7220 interface and an NEC 7261 hard disk controller interface (1984).

I would also be more than happy to contribute to the Pascal column.

Robert C Hughes
265 Wroe Ave
Dayton, OH 45406

Editor's note:

Anyone wanting to contribute to the Pascal column should get in contact with John Jones. John is a really neat person who's worth contacting even if you are just interested in Pascal.

Your other offers, Rob, are very exciting. They are great projects!! See this issue for Trevor Marshall's versions of these same things.

Dear Editor,

Horrors! Murphy has struck. The article I wrote on putting a LST: in your BIOS (issue #10 page 4) has a problem. It appears that SYSGEN ignores inputs from a SUBMIT program so that the .SUB file I included with the article does not work.

The easy fix is to remove the XSUB from the SUBMIT. You will have to do more input during the BIOS incorporation because you have to enter data from the keyboard rather than having it passed by SUBMIT. Otherwise the process is the same.

I hope no one was unduly inconvenienced.

Richard Barnett
604 Robinson St
West Lafayette, IN 47906

Editor's note:

Someone should try the original .SUB file under SUPERSUB. That might work better than SUBMIT. Anyway, thanks for the update and thanks again for the super article.

Dear Editor,

Keep up the good work. Don't let anyone try to make you into a *Byte* etc. I am renewing even though I am building an S100 board. You have so much really helpful information including a lot of hardware articles that I can't get elsewhere.

C. Senger
11309 Markab Dr
San Diego CA 92126

Dear Editor,

I am looking for a Double Density modification using the Western Digital 2795 (all-in-one disk controller chip) and a new BIOS.

Mark Hedin
320 Prospect Ave #9
Redondo Beach, CA 90277

Dear Editor,

I would like to know if anyone has a daughter board that will handle 5" and 8" SD and DD drives at the same time.

Dan R Farris
6101 Alvis Circle, SW
Albuquerque, NM 87105

Editor's note:

So would a lot of people. I get requests for this kind of drive interface almost daily. (Anyone listening?)

Dear Editor,

I'd like to become a Big Board contact for Central Europe. I'm stationed at the Ramstein Air Force Base. People can call me at 0631-54908 just about any time.

Also, UNIVAC just got the contract for the new phase IV computers for the Air Force. This means that Burroughs will probably be dumping a lot of older equipment on the surplus market. Along this line, is anyone familiar with a Burroughs RLP, and has anyone interfaced it to anything but a Burroughs? I'd like to get mine going.

David Burgess
Box 5921
Ramstein AB
APO NY, NY 09012

Dear Editor,

Instead of cutting board runs when making modifications to the BB you can often bend the IC pins out of the sockets and then solder jumpers to the pins. This type of change is much easier to undo than cuts on the board.

David Strauss
247 Greendale Ave
Needham, MA 02914

Dear Editor,

I have not had many disk problems in the last four years. But recently, the system crashed while booting and it destroyed the directory. Ward Christiansen's disk editor helped me recover some of the text files but I lost the rest. Very discouraging.

I'd like to see a utility that would copy the directory to another place on the disk (a reserved area?) or to another disk. Then, if the utility could access the disk using the special file as a directory we'd be all set.

Rex Buddenberg
1910 Ash St
North Bend, OR 97459

Dear Editor,

In a recent issue you asked us to let you know if we had experience with dBase II. I have been using it for a year now and find it excellent. I am about to take delivery of my first run-time packages ($50 per copy) so that I can start to resell the results of my labors.

I have been looking at updating to the BB II or the Insight Enterprises board (issue #8). I need to transfer data from 8" to 5" but find the drives cannot yet be mixed on the BB II.

I spoke to Bill Siegmund but he was about to depart with all his equipment to escape the rising California floodwaters. It's ironic that we, meanwhile, are experiencing the worst drought in our history.

I issue #6, Andrew Beck mentioned he was trying to bring up Turbodos on the Big Board. Do you know if he has had any success? Also, is there any way to run CP/M 3 on the BB I?

And may I once again reiterate my satisfaction with the quality of your publication. You have no idea what a breath of fresh air it brings to the technological desert we live in Down Under.

Jim Reid
82 Parriwi Rd.
Mosman 2088 Australia

Editor's note:

Bill Siegmund's back now, and pretty much dried out. I am working on reviews of a number of the data base handlers so I really appreciate your comments about dBase II. Good data base application generators can be invaluable to the programmer and to the end user but most of them are quite expensive, too expensive for casual purchase.

Please, anyone using dBase II, Selector, Quick-n-easy, Software Associates database system, dBase Window, etc. please fill about a page with: the name of the package, the retail price, where it's available, short description (database language or screen generator), main strengths, main weaknesses, how it compares with any other packages you've tried, and your general impressions. When you send me your page, specify which user disk you want in return. Try to get your comments in to us by the middle of June. (Also read the database overview in this issue.)

Dear Editor,

While using the PFM monitor DUMP command, I noticed a bug. The ASCII dump resets bit 7 of the hex byte so a C3H displays as a 'C' just like a 43H.

Walking through the monitor I found the RES 7,A at F23CH. Just NOP out the two-byte instruction and the dump works.

This helped eliminate attendant confusion (confused attendants?) during the birth of yet another BB I (with the prodigious name of ACME). There goes my favorite Saturday morning cartoon.

Thanks for all the assistance your fine magazine and readers have provided.

Jordan Freedman
93 Vine Street
Newton, MA 02167

(Letters continued on page 20)

What's wrong with CP/M®?

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Souping Up the BB I

By Trevor Marshall

3423 Hill Canyon Ave
Thousand Oaks, CA 91360
BB RCPM 805-492-5472 24 hrs

Editor's note: The following are some of the hardware mods that Trevor has done to his BB I. Steve Hope helped develop the video mods which, I understand, include longer descenders for lower case. The files refered to in this article are available on weekends on Trevor's RCPM. You'll get a chance to meet him and possibly see a version of his system if you come to the Semi-Official Get Together (SOG).

Reliable 5MHz Operation

First, you will need to replace the monitor EPROM with a 2716-1. The 2716-1s distributed by DR work fine. I used the one they supplied for the character generator, which works OK with any 'Garden variety' EPROM. Program your fast PFM monitor before attempting the following steps.

The RAM array is refreshed by 128 RAS only cycles. The delay needed to clock in the column data is provided by U76.

To operate at 5MHZ we must cut the tracks to pins 4 and 5 of U76 and move the CAS line to pin 4 and the MUXC to pin 3. The Z80 clock can then be changed from U96 pin 4 to pin 5.

The clock line for the Z80 chips has to be damped since it is resonant and the ringing causes problems. Two 33-ohm resistors are needed, one in series with the collector lead of Q2, (which must be changed to an MPS3640), and one in series with pin 8 of U77, (which must be changed to a 74S04). A 3K resistor must be soldered between pins 3 and 7 of U77 to yield a more symmetrical 20MHz waveform.

The track to pin 8 of U77 is cut on the top of the board between U77 and U79. The 33-ohm resistor is soldered between U77 pin 8 and the plated through hole adjacent to pin 16 of U80.

More Details

Cut trace between pin 4 of U96 and pin 9 of U78 on bottom of board. Link pin 5 of U96 to pin 9 of U78.
Cut trace between pin 5 of U76 and plated through hole adjacent to pin 3 of U65. Link this plated through hole to pin 4 of U76 Cut trace between pin 4 of U76 and plated through hole adjacent to pin 8 of U52. Link this hole to pin 3 of U76.

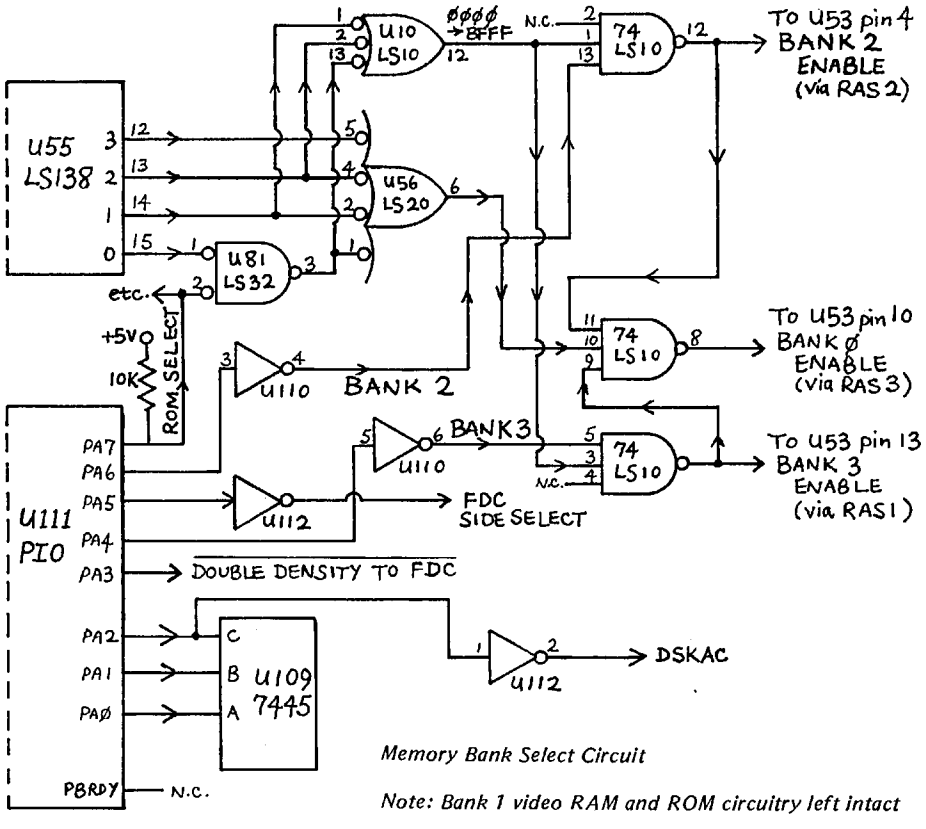
Lower Case Modifications

You will need a new character EPROM, see file DISPPROM.BB (on the above bulletin board) for a hex image for your prom programmer.

1. Remove link between pins 14 to 3 of U11.
2. Cut trace to pin 4 of U11 below board.
3. Link pin 3 of U11 to plated through hole adjacent to pin 9 of U21 (below board).
4. Link pin 4 of U11 to pin 11 of U9.
5. Cut trace to pin 11 of U9 below board.
6. Link pin 5 of U25 to pin 9 of U60.
7. Link pin 8 of U22 to pin 19 of U73.
8. Cut trace on bottom of board from pin 19 of U73. It comes through a plated through hole adjacent to pin 4 of U73.
9. Cut trace to pin 11 of U9 between U9 and U10 on top of board.
10. Cut trace to pin 12 of U10 between U10 and U11.
11. Cut trace to pin 5 of U25. It emerges between pins 6 and 7 of U23 and disappears between pin 8 and 9 of U22 on top of the board.
12. Link pin 7 of U11 (earth) to the plated through hole of the trace which used to go to pin 4 of U11; it is adjacent to pin 13 of U22.

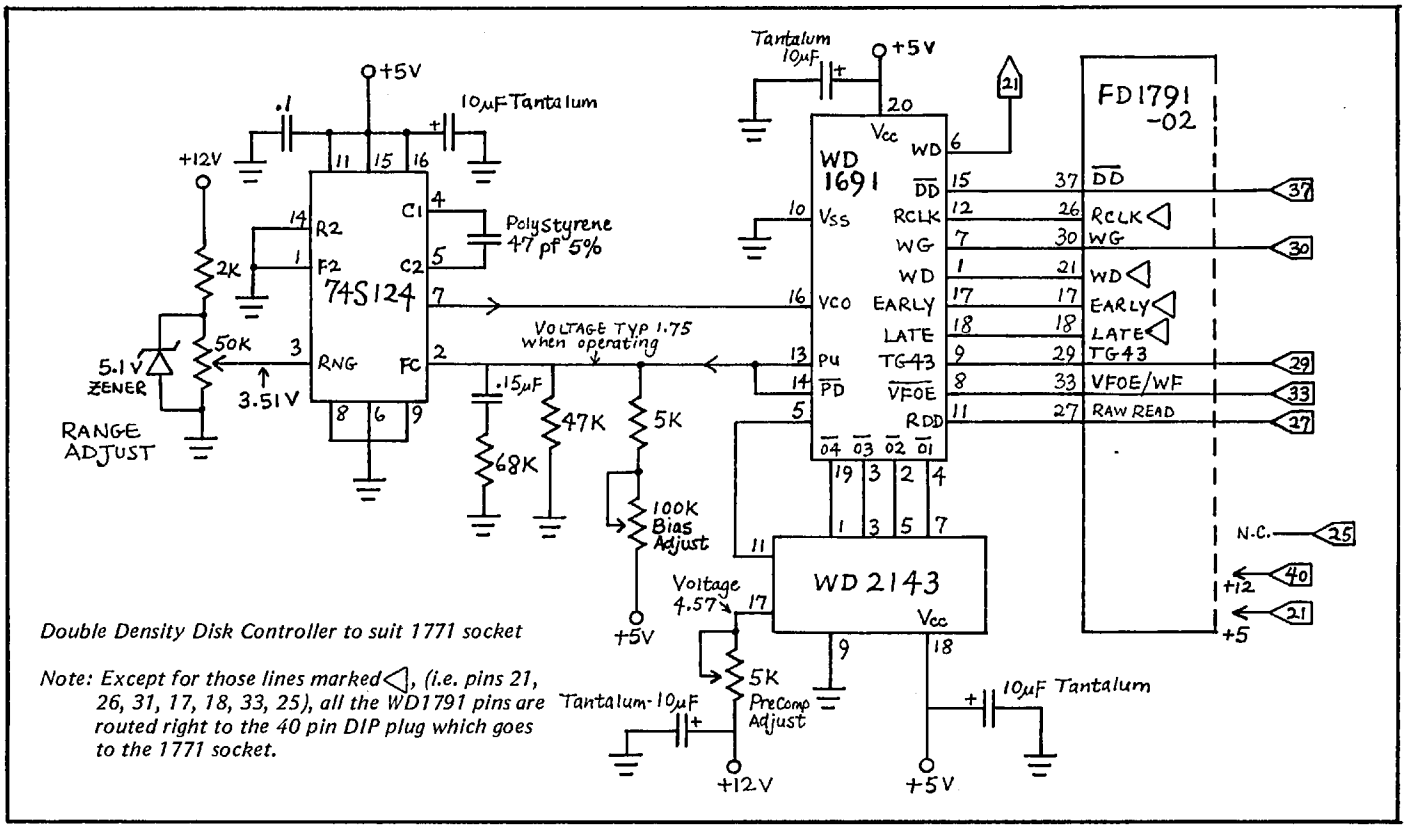
Double Density Floppy Controller

1. Cut trace from pin 12 of U111 on top of the board before it goes to the plated through hole. The software has been rewritten so that the PBRDY handshake is not required.
2. Cut trace from U102 pin 37 to U102 pin 22. Link U102 pin 37 to U111 pin 12. This is the Double Density control line.
3. Link U111 pin 9 to U112 pin 13. Link U112 pin 12 to pin 14 of J1 (the floppy disk drive header). This connects the Side Select circuitry of the YEDATA drives.
4. Cut the track from U102 pin 27 on the top of the board between U102 and U104 pin 6. Link U102 pin 27 to U101 pin 3. This is the RAW DATA line, which must bypass the on-board circuitry when using the double density controller. When changing back to the 1771 this is the only line which must be repaired. Pin 37 may be left as modified.



Memory Bank Select Circuit

Note: Bank 1 video RAM and ROM circuitry left intact



Double Density Disk Controller to suit 1771 socket

Note: Except for those lines marked ◁, (i.e. pins 21, 26, 31, 17, 18, 33, 25), all the WD1791 pins are routed right to the 40 pin DIP plug which goes to the 1771 socket.

5. Cut track from U112 pin 1 on top of board before the plated through hole. Connect U112 pin 1 to U111 pin 13. The drive power signal is now derived directly from the drive select enable line. (leaving pin 8 free for the CACHE memory bank select).

Adding Extra Banks of 64K RAM

1. We need to disconnect the select lines to U53. First isolate U53 pin 10 and U53 pin 4 by cutting the tracks from them between U53 and U54. Then cut the tracks from U53 pin 13 and U53 pin 1 between U53 and U54.

2. The multiplexer to drive A7 of the 64K RAMs must be freed. It is currently used as a buffer. Cut track between pins 10 and 11 of U59 underneath the board and from pin 10 of U59 between U59 and U58 on top of board. Cut track from pin 9 of U59 next to R13. Now link the 33-ohm resistor that was connected to pin U59 pin 9 to the plated through hole just below pin U56 pin 8. (This hole used to lead to U59 pin 10. (A buffer is not required.)

3. The 64K RAM chips only require a +5-volt supply. All the supplies must be re-routed, and the old +5-volt supply lines now become A7. Remove C1-C8. Cut the tracks from each of C78-C85 to pin 9 of each column of the RAM array. Link pin 9 of each column to the next (8 links or a daisy chain). Connect U59 pin 9 to U46 pin 9 with a 33-ohm resistor (underneath the board). Connect A15 and A14 to the multiplexer by linking U59 pin 10 to U55 pin 1 and U59 pin 11 to U55 pin 2.

4. The +12 and -5 supplies to the RAM array must be cut. The 8 tracks to the rows of the RAM array that carry them must be cut. To be sure that you have not missed any, it is wise to short pins 1 and 8 of U1, U13 and U26 and to place a 5V MOS protection diode type MPT5E (or 5.6V, 5-watt zener if an MPT5E is not available) between pins 16 and 8 of any one of the RAMs.

5. The new +5 volt supply can conveniently be connected by soldering an RF choke (6-hole type) between pin 8 of U39 and the +5 rail adjacent to U53.

6. Extra BANK SELECT gating must now be provided. An extra 74LS10 is added to the board between U8 and U9 to provide the additional functions, however if two extra banks of 48K are desired then U10 pins 2,1,13 must be freed for use by the bank select circuitry. Pin 2 passes under IC towards U11. Cut it between the two ICs. The pin 12 track should already have been cut. Cut tracks to pins 1 and 13 on the underside of the board. The 74LS10 alone can handle the cache memory.

Bank Select

BANK 0, the main memory bank is enabled whenever any of the 4 outputs of U55 are active (low) and all of BANKS 1, 2 and 3 are not active.

BANK 1, the disk CACHE memory, is enabled when pin 8 of U111 is active (LOW). At power-on PA6 floats (HI) and BANK 1 is thus disabled.

BANK 2, the spare memory, is enabled by sacrificing the BELL (on PA4). It is enabled if the appropriate jumpers are installed and PA4 is LOW. Don't jumper these if you are using the bell! You also need to modify the operating system. (Editor's note: Here's where CP/M vrs 3 comes in.)

The file BBSYSTEM.ZQ0 is the BIOS I use for CP/M and the monitor ROM. The file BBDRIVER.ZQ0 is the CACHE buffer BIOS I developed for INFOSOFT IOS v2.34.

Critical ICs

U75 should be 74151
U77 must be 74S04 SHOTTKY TTL
U76 should be 74164
U59 and U58 must be 74157
U112 should be 7414
U109 should be 7445

All Z80 chips should be Z80B types, although only Z80A CTC, SIO and PIO are currently available. These A parts seem to work well, as does standard 250 nsec memory.

■ ■ ■

Detailed View of the BB II

By Brett Berg

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Roy, UT 84067
801-776-5024 BB RCPM

The following is a detailed look at setting up the BB II. First we'll discuss the video section followed by BIOS incorporation, disk drive interfacing, WordStar, and more.

The Video Section

The Big Board II uses the Motorola 6845 Video Timing Controller along with a Standard Micro Systems 8002-003 Video Display Attributes Controller. The 6845 sets up the screen refresh and sync timing. It also handles the scroll and cursor positioning. A light pen can be connected to the designated input on the 6845. This input is located on the edge of the board in the power block.

The 8002 handles the character and graphics generation. It also creates the cursor and the various attributes that have been mask-programmed into it. The two chips provide a very advanced video display system using just a few parts.

With the new 'X' command in the monitor, the Big Board II user can directly access video RAM by switching to bank 0. When you enter X0, for instance, you select bank 0 where you'll find ROM starting at address 0000H, character RAM starting at address 6000H, and attribute RAM starting at address 7000H.

If you insert hex codes from 00H to FFH into the video RAM using the Modify memory command in the monitor, the screen will display all of the characters of the 8002. Dumping the video attribute memory with the Dump command, will show 03H in all attribute positions, which is the default attribute of standard ASCII.

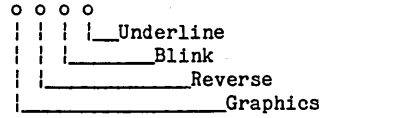
The easiest way to change the attributes of the screen is to return to bank 1 (main memory) and do the following:

Boot up CP/M, and type ESC 'G' attr. The table below lists the attribute, in ASCII, that will be assigned with the attr. character chosen. For example ESC 'G1' will produce underlined ASCII for every letter typed. The attribute byte will remain in effect until terminated (even across lines), and must be reset by typing ESC 'G0'.

ASCII Character	Function
0	Normal
1	Underlined
2	Blinking
3	Underlined, Blinking
4	Rev
5	Rev, Underlined
6	Rev, Blinking
7	Rev, Blinking, Under
8	Normal Graph
9	Underlined Graph
A	Blinking Graph
B	Under, Blinking, Graph
C	Rev, Graphics
D	Rev, Underlined, Graph
E	Rev, Blinking, Graph
F	Rev, Blink, Under, Graph

Another way of thinking of this is to consider the least significant four bits of the attribute byte (see Figure 1).

Figure 1 - BB II Attribute Bits



If Attribute mode 8 through F is selected, graphics are displayed according to the current Graphics Mode selected. To select the Graphics Mode input ESC 'M' mode>. This is done the same as the attribute setting described above. There are four modes in the Graphics Mode listed below.

Graphics Modes

0 Block Graphics Mode
1 Bar Graphics Mode #1
2 Bar Graphics Mode #2
3 ASCII Character Mode

Setting up the Display

You have a number of options when setting up the Big Board II display. First, the 8002-003A part requires a 16MHz crystal. Switch number 4 should be set to the off position and both jumpers on JB13 must be installed. This sets the scan row counter for twelve rows and full descenders.

There is one problem with using this mode, the monitor must be able to handle an 18.7KHz horizontal scan rate. (Editor's note: with the new video setup routine available from Cal-Tex, most garden variety, 15.750 KHz monitors will work, displaying descenders and all. This routine, however, will not necessarily provide perfectly centered etc. display for all monitors without some futzing on the centering, or the width. See below.)

The 8002B

You can select the 8002B attributes controller instead of the 8002A. The difference between the two parts is the 8002B does not have descenders and it requires an 11 MHz crystal instead of 16 MHz.

The 8002B still has full graphics and attribute options. To set the Big Board II up for the 8002B, switch number four should be in the on position and both jumpers on JB13 must be removed.

The 6845

One of the most powerful features of the new BB II is the programmable CRT controller, the Motorola 6845. It is easy to wonder, when setting up the new computer, how we ever got along without being able to easily change the characteristics of the CRT.

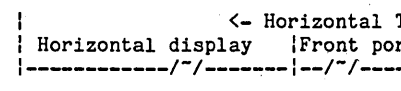
Trouble is, though, that with all that power and flexibility comes a very broad range of values that do not work with a given monitor. The following will hopefully be a help in setting up the most critical values so you can get your monitor running.

The horizontal timing registers are R0, R1, R2, and R3. They are, respectively, the Horizontal Total Register, the Horizontal Displayed Register, the Horizontal Sync Position Register, and the Sync Width Register.

These registers work together to set the horizontal timing in four areas: characters displayed, front porch, sync width, and back porch (see Figure 2).

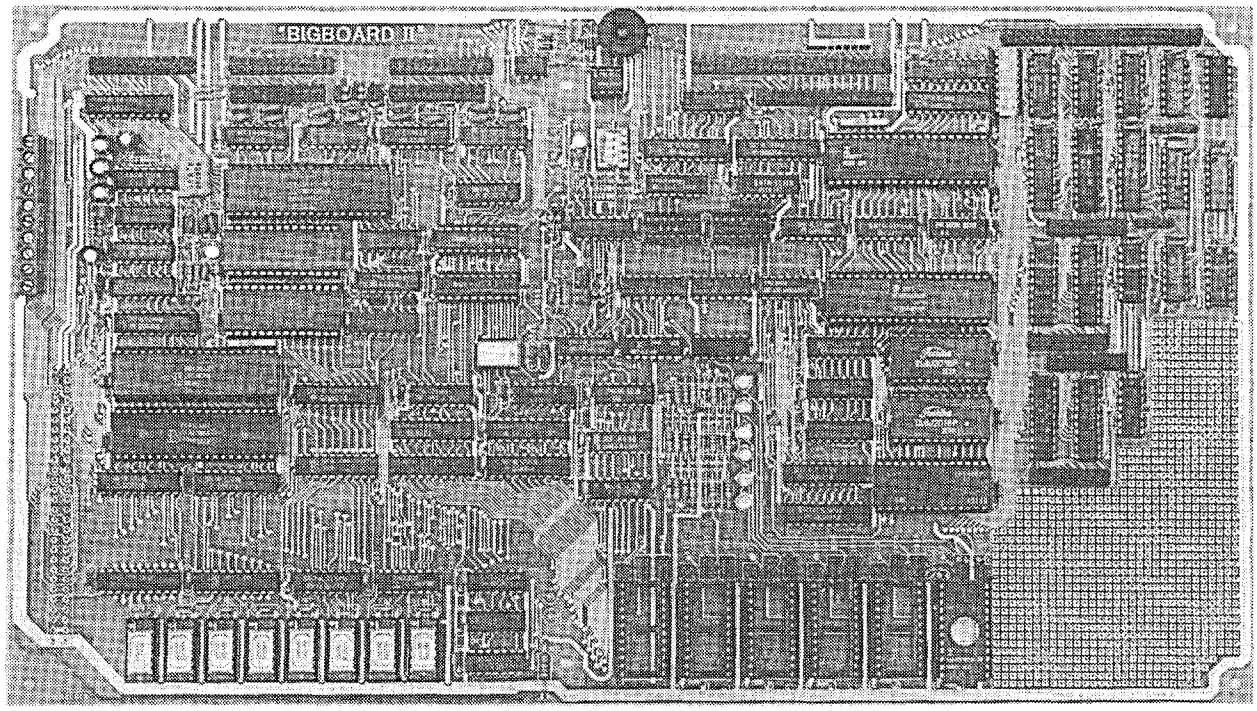
(continued on page 8)

Figure 2 - 6845 Horizontal Display



"BIG BOARD II"

4 MHz Z80-A SINGLE BOARD COMPUTER WITH "SASI" HARD-DISK INTERFACE



$895 ASSEMBLED & TESTED* $695 FULL KIT* $245 PC BOARD WITH EPROM & PALS*

Jim Ferguson, the designer of the "Big Board" distributed by Digital Research Computers, has produced a stunning new computer that Cal-Tex Computers began shipping in June. Called "Big Board II", it has the following features:

■ 4 MHz Z80-A CPU and Peripheral Chips

The new Ferguson computer runs at 4 MHz. Its Monitor code is lean, uses Mode 2 interrupts, and makes good use of the Z80-A DMA chip.

■ 64K Dynamic RAM + 4K Static CRT RAM + 24K E(E)PROM or Static RAM

"Big Board II" has three memory banks. The first memory bank has eight 4164 DRAMs that provide 60K of user space and 4K of monitor space. The second memory bank has two 2Kx8 SRAMs for the memory-mapped CRT display and space for six 2732As, 2Kx8 static RAMs, or pin-compatible EEPROMS. The third memory bank is for RAM or ROM added to the board via the STD bus. Whether bought as a bare board, a full kit, or assembled and tested, it comes with a 250 nS 2732 EPROM containing Russell Smith's superb Monitor.

■ Multiple-Density Controller for SS/DS Floppy Disks

The new Cal-Tex single-board computer has a multiple-density disk controller. It can use 1793, 1797, or 8877 controller chips since it generates the side signal with TTL parts. The board has two connectors for disk signals, one with 34 pins for 5.25" drives, the other with 50 pins for 8" drives.

■ Vastly Improved CRT Display

The new Ferguson SBC uses a 6845 CRT controller and SMC 8002 video attributes controller to produce a display rivaling the display of quality terminals. There are three display modes: Character, block-graphics, and line-graphics. The board emulates an ADM-31 with 24 lines of 80 characters formed by a 7x9 dot matrix.

■ STD Bus

The new Ferguson computer has an STD Bus port for easy system expansion.

■ DMA

The new Ferguson computer has a Z80-A DMA chip that will allow byte-wise data transfers at 500 KBytes per second and bit-serial transfers via the Z80-A SIO at 880 Kbits per second with minimal processor overhead. When a hard-disk subsystem is added, the DMA chip makes impressive disk performance possible.

SIZE: 8.75" x 15.5"
POWER: +5V @ 3A, + – 12V @ 0.1A

■ "SASI" Interface for Winchester Disks

Our "Big Board II" implements the Host portion of the "Shugart Associates Systems Interface." Adding a Winchester disk drive is no harder than attaching a floppy-disk drive. A user simply 1) runs a fifty-conductor ribbon cable from a header on the board to a Xebec controller that costs only $295 and implements the controller portion of the SASI interface, 2) cables the controller to a Seagate Technology ST-506 hard disk or one compatible with it, and 3) provides power for the controller-card and drive. Since our CBIOS contains code for communicating with hard-disks, that's all a user has to do to add a Winchester to a system!

■ Two Synchronous/Asynchronous Serial Ports

With a Z80-A SIO/O and a Z80-A CTC as a baud-rate generator, the new Ferguson computer has two full RS232-C ports. It autobauds on both.

■ A Parallel Keyboard Port + Four Other Parallel Ports for User I/O

The new Cal-Tex single-board computer has one parallel port for an ASCII keyboard and four others for user-defined I/O.

■ Two Z80-A CTCs = Eight Programmable Counters/Timers

The new Ferguson computer has two Z80-A CTCs. One is used to clock data into and out of the Z80-A SIO/O, while the other is for systems and applications use.

■ PROM Programming Circuitry

The new Cal-Tex SBC has circuitry for programming 2716s, 2732(A)s, or pin-compatible EEPROMs.

■ CP/M**

CP/M with Russell Smith's CBIOS for the new Cal-Tex computer is available for $150. The CBIOS is available separately for $25.

---

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DETAILED VIEW OF THE BB II
(continued)

The horizontal display is set by R1 and determines how many charcters will be displayed on the line. This is set to 80 in the ROM.

The next area, defined by R2, is the front porch or Sync Delay. This sets the time between the last character and the start of the sync pulse. The front porch default value is 71.

The next value, the Horizontal sync pulse width, is the low order four bits of R3 (the upper four bits are used for the vertical sync width in the 6845). The default value is 8.

Finally, the back porch or scan delay is defined by R0 (in conjunction with the other registers). From the timing diagram above, you can see that given the Horizontal total and the first three elements, the 6845 can deduce the scan delay.

Note that all the timing values above are the values actually encountered in the ROM for the 7x9 character set and are defined in character times, not 'real' time. The final timing is determined by the clock frequency (16 MHz).

Suggested Changes

Now for some practical help in configuring your monitor.

We used monitors initially set up for 15,750 Hz horizontal sweep. Needless to say this was not compatible with the 18,600 Hz required by the BB II.

The first thing to do is slowly increase R0 (horizontal total). By tuning the horizontal sweep rate, on the CRT monitor, we could keep up with the slowly changing timing. Each increase in R0 made the characters slightly smaller (more characters in the same scan time, right?) until we had 80 characters displayed on the screen.

Problem: as R0 is increased, the front porch (R2) needs to be adjusted to keep the display on the screen. Increasing R2 moves the display to the left, decreasing R2 moves it to the right. These are the only changes we needed to make. You may find that the sync width needs to be adjusted as well.

Do not alter R1 (horizontal display). To do so will require changes to other areas in the BB II monitor ROM since PFM is counting on displaying 80 characters per line.

Several different monitors were adjusted using this technique. After a little fine tuning of the hardware and software, the BB II makes a very impressive display.

One final note on using PFM to alter the register values. Once the display has started scrolling, the system ignores changes to the registers, so an occassional CTRLZ (clear screen) is necessary.

DC is the port used to tell the 6845 what register you will be working with, then use port DD to actually put the value there. Figure 3 shows the commands which worked for our monitors.

Installing Disk Drives

We used two Shugart 850 Double Density Double Sided disk drives. They work very well with the standard software timing that the Big Board II uses. See Figure 4 for jumper configuration.

More Drive Details

Five-inch drives do not supply a drive ready signal, so the ready line on the disk controller must be tied to five volts. This is done at JB4 by inserting a jumper from the center pin to the pin facing the drive connector.

To jumper the board for the ready line that is supplied by most eight-inch drives, install a jumper from the center pin to the pin farthest from the drive connectors.

Next comes the option that enables the write precompensation. Single density drives will have this option disabled and double density will have it enabled. To select precompensation, install a jumper from the center pin of JB38 to the pin farthest away from the disk drive connectors.

You can have write precompensation on all tracks or just after track forty-two. Five-inch double density will have write precompensation on all tracks, while most eight-inch drives only need it on the inner tracks. Eight-inch drives run fine with it enabled for all tracks, but it is not necessary and there is a possibility of incompatibility with other systems.

Last comes the clock selection for the drives. Five-inch drives have a lower data transfer rate than the eight-inch drives, so the clock to the disk controller chip must be halved. On JB35 jumper the center pin to the pin nearest the CTC for eight-inch drives, and away from the CTC for the fives.

BB II Double Density

The Big Board II can be brought up with the same software that the Big Board I used, but it will only be single density.

The CBIOS disk from Cal Tex Computers has the necessary utilities to change the Big Board CP/M to the version needed for double density operation. It just takes a few minutes to make the modifications.

The CBIOS disk from Cal-Tex contains several versions of CBIOS. Each version has a MAC file (for assembly by M80) and its associated HEX file.

The DS60E8 and DS60EA files are for two-drive double density systems with 59.5K and 60K CP/M. The SS60E8 and SS60EA files are for four-drive single density 59.5K and 60K CP/M. Lastly the SW59E4 and SW59E6 are for two-drive double density 59.5K and 60K CP/M with one Winchester.

The disk also contains a disk formatter called BB2FORMT. This utility will format a disk in one of eight formats. The Big Board II will automatically figure out the format of a disk that it is reading, so you can use any of the formats.

The sector skew should be set to 1 for single density and 3 for double density.

Figure 4 - Shugart 850 Jumpers

JUMPER	DESCRIPTION	OPTION
DS1	Drive Select #1	In *
DS2,3,4	Drive Select #2,3,4	In *
1B-4B	Side Sel Using Drv Sel	Out
RR	Radial Ready	In
RI	Radial Index and Sector	In
R	Ready Output	In **
2S	Two Side Status Output	Out
850/851	Sector Option Enable	850
I	Index Output	In **
S	Sector Output	Out **
DC	Disk Change Option	Out
HL	Stepper Power frm HLoad	In **
DS	Stepper Power frm DSlct	Out
WP	Inhib Wrt When Wrt Prot	In
NP	Allow Wrt When Wrt Prot	Out
D	Alternate Input In-Use	Out
DD	Standard Drive Select	In
DL	Door Lock Latch Option	Out
A,B	Radial Head Load	In
X	Radial Head Load Shunt	Out
C	Alternate Input HLoad	In
Z	In Use from Drv Select	In **
Y	In Use from Head Load	Out
S1	Side Sel frm Direc Sel	Out
S2	Standard Side Select	In
S3	Side Sel from Drive Sel	Out
TS,FS	Data Separ Opt Select	N/A
IW	Write Current Switch	In
RS	Ready Standard	In
RM	Ready Modified	Out
HLL	Head Load Latch	Out
IT	In Use Terminator	In
HI	Head Load or In Use	Out

** These jumpers are located near the I/O connector in a 16 pin dip socket (marked 4H).

* Jumpered according to logic position of drive.

Once you have decided which CBIOS you'll use, refer to the BIOS.DOC and MELDING.DOC files on the CBIOS disk.

Using SID or DDT, load the CP/M file that you have produced via MOVCPM. Move the CP/M out of the way by typing M0980,1F7F,4000. This will move CP/M so the lower part of memory can be cleared. Fill lower memory with 00H (NOP) by typing F100,3FFF,00. This clears lower memory with a value that will not affect the operation of the Z80.

Next prepare to read the selected CBIOS. For example, for DS60E8.HEX, type IDS60E8.HEX. Now read the file into memory from disk using the read command and the offset specified in the MELDING.DOC file.

In the case of DS60E8.HEX the command would be R2200. This will read the CBIOS into memory at A00H and the one-sector loader at 900H with the signon message at 980H. This is a little different from the BB I and other CP/M computers, but is needed for the version of Sysgen supplied.

There are several cold boot routines that are loaded into areas of memory that are overwritten after boot. There is no need for these routines to be in the permanent BIOS as they are only used during cold boot. Also there is not room in the BIOS to store these routines.

Now move CP/M back down to 1600H by typing M4000,55FF,1600. CP/M and the CBIOS are now ready to be saved and copied onto the system tracks of the newly formatted disk. SYSGEN8 is provided on the CBIOS disk to generate and copy the system.

With the new system on the newly formatted disk, the Big Board II is now fully operational. The copy routines that were previously used on the Big Board I cannot be used on the Big Board II, but PIP can be used in the global format. For example, the command PIP A:=B:*.* would copy the entire contents of disk B to disk A. All CP/M 2.2 compatible programs and utlities that use the BDOS seem to work fine. Of special interest are SWEEP, FIX, and DU.

Connecting a Keyboard

The keyboard connector for the Big Board II is the same as the Big Board I. The connection diagram is shown below. The Big Board II does not have to be jumpered for the strobe polarity. It senses the strobe polarity on the first keypress and stores the level information in memory. This is very nice when bringing up the board for the first time. Connect a test jumper to pin 17 of the keyboard connector. Ground the free end of the test jumper and the monitor will display the monitor startup message. So a keyboard is not necessary to test the board.

Patching WordStar

Almost immediately after we got the Big Board II running we just had to patch WordStar! The Big Board I does not support some of the special features that are available with WordStar, but the Big Board II does.

We quickly got out appendix E of the WordStar Manual and began plotting massive changes. The first thing we noticed was the section on cursor positioning. Since the Televideo 920 uses the same cursor positioning commands as the Big Boards we ran INSTALL.COM with the TVI 920 set for the terminal. The 920 uses the special functions of WordStar but not in the same way as the Big Board.

See Figure 6 for patch points to optimize Word Star.

With these changes in place Word Star will run faster and look great. All of the menu information is printed in reverse video with section titles in normal video.

When a block is labeled for a block operation the text within the bounds of the block is changed to reverse video to make formatting easy. If you don't like reverse video, you can select any of the other attributes and subsitute the appropriate value in the last byte of each patch.

■ ■ ■

Figure 3 - 6845 Video Patch

```
ODC,0  - Tell the 6845 we want R0
ODD,6F - 111 characters per line
         (the 80 you see plus another 31)
ODC,2  - Now we want R2
ODD,59 - Position the display on screen
```

Figure 5 - Port Addresses

```
PORT NUMBER  FUNCTION

 80  SIO Data Port A
 81  SIO Control/Status Port A
 82  SIO Data Port B
 83  SIO Control/Status Port B
 84  CTC A Channel 0 - Keyboard Strobe
 85  CTC A Channel 1 - Index Pulse Count
 86  CTC A Channel 2 - SIO Sync Interupt
 87  CTC A Channel 3 - VSYNC Interupt
 88  CTC B Channel 0 - SIO A Baud Rate
 89  CTC B Channel 1 - SIO B Baud Rate
 8A  CTC B Channel 2 - 1 Millisecond Timer
 8B  CTC B Channel 3 - Clock Interupt
 C0  Memory Control - Program
 C4  Sense Inputs - Index, Kbst, SW4
 C8  Misc System Control Bits - U14 Latch
 CC  Drive Select/DMA Mux
 D0  Keyboard Inputs
 D4  Select Disk Controller
 D8  Select General Purpose Parallel Ports
 DC  Select 6845 Crt Controller register
 DD  Use selected 6845 register

CTC BAUD RATE DIVISOR

DIVISOR BAUD RATE

 128  300 BPS
 64   600 BPS
 32  1200 BPS
 16  2400 BPS
 8   4800 BPS      * Divisor is in Decimal. Convert to
 4   9600 BPS        hex and output to port 88 for SIO
 2  19200 BPS        port A and port 89 for SIO port B
```

Figure 6 - Wordstar Customization

```
ERAEOL 01,18       Erase to end of line
LINDEL 02,1B,52    Delete line
LININS 02,1B,45    Insert line
IVON   03,1B,47,34 Inverse video on
IVOFF  03,1B,47,30 Inverse video off
TRMINI 01,1A       Terminal initialize
TRMUNI 01,1A       Terminal un-initialized
```

Dyna, A Very Fast Disk

Review by David Thompson

The disk I'm using to hold this text during editing is not a disk at all. It is a memory board with 256K of 4164s. The difference between this and a regular disk is incredible. Absolutely incredible.

History

First I have to warn you that I am a little biased. Tony Ozrelic (the sole owner, employee, and dishwasher for LA software) called me one evening and mentioned that he was trying to figure out what would sell to the Big Board folks. He is a hardware engineer who has been trying to make it on his own writing and selling software tools (really neat tools but that is another story). The tools have not been selling.

Anyway, he mentioned a few ideas he had, and in passing, added that he had wire-wrapped up a 256K RAM disk for his Big Board. Being a person who sees the obvious in almost no time at all, I suggested that he market the RAM disk. Then I signed up for board #1.

Tony brought board #1 up to the Computer Faire and I got my first glimpse of what I/O had been doing to me all this time (and I mean TIME). A number of other Big Board owners also got a first-hand chance to drool all over my new Dyna-powered screamer. (Unfortunately I didn't get a chance to cruise the strip with it.)

Since you can't see what my Dyna does first-hand (unless you come to the Get Together—which is not a bad idea) I'll try to give you an idea what it does.

How Fast Is It?

First of all, once you have loaded Dyna (it takes 38 seconds to transfer the entire contents of a disk into Dyna), you are surprised by the silence—the drive motors don't so much as twitch, and normal CP/M activities become instantaneous.

Run your fancy directory program such as "DIRR" and the files are displayed almost before you hit the carriage return. You can get into and out of your text editor so quickly and easily that editing multiple files with a single-file editor is often easier than using a fancy multiple-file editor with standard disks.

Large assemblies become trivial. If there's an error in the source, it's no great loss. I can correct a 46K source file with my text editor and then do a complete reassembly in just over a minute. It took over four times as long to do the same thing on disk.

Sample times in seconds on 4MHz BB with single density disks.

Disk	Dyna	Description
182.0	40.0	M80 assembly of 46K source, yielding 108K PRN file
120.0	16.0	CRC of 39 files (194K)
27.3	1.8	Create second copy of 22K file using PIP
348.0	2.4	VERIFY all ""sectors'' on disk and Dyna
14.1	.8	Load 11K text editor and 22K text file
14.5	.8	Exit 11K text editor and create new 22K text file

The editor times (above) are the best example of how responsive the system gets. I have a good stopwatch, but a significant share of the .8 seconds is simply reaction time. Many other CP/M processes are so quick they appear instantaneous. I'd like to see the IBM PC (or the IBM anything) take on my little Z80 now!!

Ease of Use

Dyna is very easy to use. You just boot up on drive A, and then enter "DD" which formats Dyna, copies the entire contents of drive A into Dyna, and then does a swap (Dyna becomes drive A and the disk becomes drive D). You also get small (1K) programs that do each of these functions individually.

Dyna has not generated any BDOS errors. You know, "drive not ready," or "bad sector." If your CP/M contains ZCPR as mine does, Dyna is perfect as drive A. All of the .COM files on Dyna are automatically available on the other drives, so it's much faster to NOT have the .COM files on drives B-D because the programs load so much more quickly from Dyna.

PIP transfers between Dyna and a disk are twice as fast as the same transfer between two disks.

More Details

I had to give up double density on this BB to run Dyna, although I don't see why you couldn't use Software Publishers' dual-density package along with Dyna. You see, Software Publishers' dual density board can run the original single-density BB bios just fine so you can run Dyna. When running double density, however, you wouldn't have access to the RAM disk.

If you have four drives on your system already, the D drive will be disabled when you enter Dyna. However you don't have to junk your D drive. You can go ahead and use it just as you used to without entering Dyna. Once you are into Dyna you can get out by hitting the reset button and rebooting then you can use the real drive again.

Resetting and rebooting, however don't affect the contents of Dyna. So, you really can have five 241K storage devices. Just enter "DYNA" and the RAM disk is back with all its data intact.

So far, Dyna has hung on to its data no matter what I've done to the system. I purposely ran the system for a whole day with the fan off (the cabinet got very warm) but Dyna didn't lose a single bit. The only thing you have to remember is to copy Dyna to a real disk before powering down.

Documentation

Tony did his usual very thorough and well-written manual. It is not fancy, just dot-matrix output, but it is very laid out so it is easy to find the information. A lot of typeset manuals with color covers should be this nice to use.

A Quick Conclusion

I love it. I suppose I shouldn't have even tried it, because in just a few days I've become very aware of the penalty that flexible disks extract. Now I expect things to happen instantly.

Using the RAM disk has been a sort of quantum leap, very much like moving from cassette tape to disk. Now it is frustrating to go back and use a system which has only floppies. Very frustrating.

■ ■ ■

Easier Reverse Video Cursor

By John J. Phillips

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114 East Park
Olathe, Kansas 66061

For some time now I have had a reverse video blinking cursor. I want to share it because it is quite simple—requiring no trace cuts and only a few jumpers.

First, remove U25 and bend out pins 2 and 3 and reinsert (we are bending out the pins to that they don't go back into the sockets). On the underside of the board, jumper U25 pin 4 to U25 pin 1. Install a second jumper connecting U37 pin 11 to U74 pin 11.

Next remove U75 and bend out pin 6. Now prepare to piggy-back a 74LS158 on top of U75. Setup the 74LS158 by bending up all of its pins except 5, 6, 8, and 16. Add a short jumper between pin 8 and pin 15 on the 158. Place the 158 on top of the LS151 and carefully solder pins 5, 6, 8, and 16 of the 158 onto the same pins on the 151. Now reinstall U75 (with the piggy-backed 158 on top of it). Make sure that pin 6 of U75 is not inserted in the socket.

Jumper pin 7 of the 158 to U94 pin 10 and jumper pin 1 of the 158 to U74 pin 10.

This gives you blinking reverse video controlled by bit 7. If you don't want the blink, move the jumper attached to U37 pin 11 to U37 pin 12. *(Ed. note: if you want to switch-select blinking and non-blinking just add a simple single-pole, double-pole switch to this line.)*

PFM does not set bit 7 if the cursor is located on a blank space (20H). In a space position, it displays an underline character instead. If you would rather have the space displayed in reverse video you can use the memory utility in PFM to alter the monitor.

MF54A
(PFM will respond with)
F54A 20

Now enter a character value not normally displayed, such as a value less than 20H. Then boot CP/M.

■ ■ ■

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C'ing Clearly

Column by Tony Ozrelic

6708 Melrose
Los Angeles, CA 90038

Pointers

"A pointer is a variable that contains the address of another variable." Software Tools, P89.

For the novice, pointers may be mysterious and not too useful. To the assembly language programmer, pointers are old hat. In most micros, the largest register is 16 bits, and operating on items larger than 16 bits usually means passing the address of the item, rather than the item itself, to a subroutine. In C, a string of characters is not passed from one function to another—rather, it passes the address of the beginning of the string.

The declaration for a pointer to a string would look like:

```
char *answer;
```

This line is read "answer is a pointer to a character."

The char tells the compiler to make answer a pointer to a byte so that when answer is incremented, it is incremented by ones.

If answer were a pointer to an integer (int *answer;), then incrementing answer (answer++) would add two to its value since integers contain two bytes. Similarly, pointers to doubles, longs, or floats cause similar compensation in the address arithmetic.

Since answer is just an address, how do we access the characters it points to? The unary (works with one item) operator * takes the contents of answer to be an address and fetches the contents of that address. Its opposite, the unary &, fetches the address of a variable.

```
char query[20];
char *answer;

gets(query);
answer=&query;
if (*answer=='Y') return;
```

These lines of code fetch a string of characters from the console (gets (query);) and to a return if the first character is a "Y".

We could have said—if(query [0]=='Y')—or even—if(*query=='Y'). "Query[0]" and "*answer" yield the same character.

Using the statement "query[1]" is called indexing while "*(answer+1)" is called using a pointer. Either way works, but indexing requires more computer operations. See figure 1 for a copy routine in pointer and indexed versions.

In the pointer version the addresses passed to the function are used directly, in the comparison [while(*from++)], the transfer (*to++=*from), and in incrementing. This compiles to a few short lines of code.

The index example requires an extra variable i, plus the overhead of index address calculation for both the testing and transfer.

I compiled both versions of the copy program. Aztec C generates 36 instructions (pointer) and 88 instructions (indexed). Q/C generates 23 instructions (pointer) and 72 instructions (indexed). Q/C creates fewer instructions because it does calls to its runtime library for fetches and compares, Aztec generates inline code.

C Compiler Wish List

I wish all compilers would come with a trace option like the one in Q/C. A program compiled in trace mode spits out the name on entering and exiting a function.

I also wish that Aztec would provide a Z80 runtime library with the Z80 version of the compiler. You have to create it yourself using a giant SUBMIT file. It compiles and links a zillion little routines so there is no way to get the library together using two single-density drives. This irks me. I pay $45.00 a year for updates and they can't even send one extra disk along with the proper library on it.

■ ■ ■

Figure 1 - Copy Routines

Pointer version of copy

```
copy (to,from)
char *to,*from;
{
      do{
            *to++=*from;
            }while(*from++)
}
```

Indexed version of copy

```
copy(to,from)
chat to[],from[];
{
int i;
for(i=0;from[i];i++) to[i]=from[i];
to[i]=from[i];
}
```

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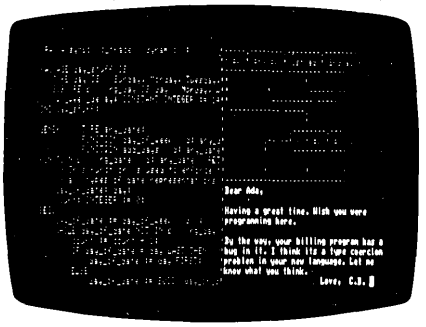

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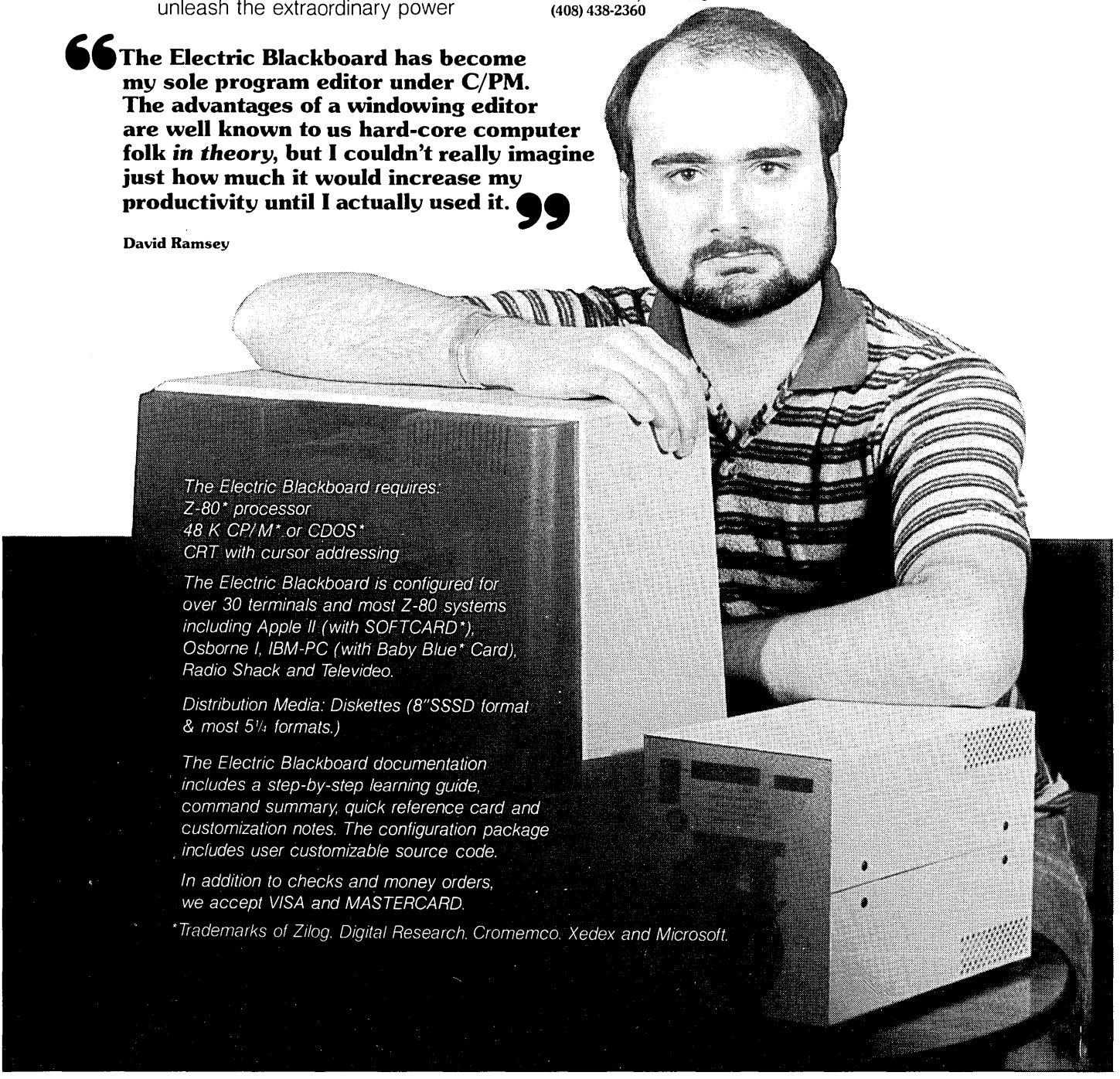

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Data Base Handlers

By Rex Buddenberg

1910 Ash St
North Bend, OR 97459

The following is a view of file managers in general, and some of the things you may want to consider when you check out a package.

There are a number of general purpose Data Base Management Systems available today. The market is similar to the word processing market a couple years ago, with new entries showing up daily. Most are known as file managers rather than data base managers (a data base is made up of a number of files) because most of these handle only one file at a time.

Data Compatibility

Most of us have some sort of file system already—either under a file manager for which you are looking for an improvement or under a BASIC or Pascal program.

Most of us are not really interested in retyping that data—it was tedious enough the first time. Similarly, the file manager that we buy today will probably not be the one we use a couple years from now. (Just like the Big Board I bought last summer may soon get supplanted with a 16 bit machine.) For the remainder of this article, I intend to describe some of the lessons I have learned.

Lesson 1—Data Representation

For this discussion, I will use a standard type of file made up of fixed-length records, each with a defined structure of fields. Variable length records, pile files and such are subjects that are worth discussing, but you are in the wrong forum! Dave's subscription list is a good example—each of us has an entry consisting of name, address, city, state, zip, expiration date and whatever else Dave's KGB has unearthed for our dossiers. When considering data mobility it is important to know how this data is stored.

Name, address and city are fairly obviously stored as alphanumeric strings—that is the easy part. Zip code can be stored as a number or a string. And the real stinker is the date field. But first . . .

The Post Office usually likes bulk mailings in zip code order so they can sort it easily. So Dave's list needs to be able to handle that. A zip code stored as a five-digit numeric is a piece of cake to sort, right? But we Yanks are getting longer zips next year, with a hyphen in it. And the Canadians and Brits have 6 digit alphanumerics that won't fit. Most alphanumeric sorts use the ASCII collating sequence to sort on, so strings consisting of the ASCII numeric characters (30h-39h) will also work—providing your numeric strings are right justified.

The second problem with numbers is that different languages and implementations store them differently. My Pascal/Z compiler stores integers as two-byte words. This limits integers to values smaller than +/-32363, a very real limitation when writing accounting programs. My old North Star BASIC interpreter stores numerics as BCD representations. Thus (operating system incompatibilities aside), the two languages cannot read each other's numbers—not good. But, both languages will allow you to convert numerics to strings and store them that way.

The conclusion to the zip problem is that numeric data should always be converted to and stored as strings.

Now for the second real problem field: dates. Naturally, Dave will want to go through his file each issue and drop those cads who have the effrontery not to renew their subscriptions. (Editor's note: Give it to 'em, Rex.) In data baseese that means make a new file(remember backups?) and select all records where "expiration date" is before, after, smaller, or larger than xx/xx/xx. Not terribly difficult to conceptualize, or to implement. But again, the standardization bug-a-boo. Christmas may come on any of the following dates:

25 Dec 1982 (militarese, note the rational ascending).

December 25, 1982 (conventional, but not convenient for programmers).

25/12/82 (French)

12/25/82 (Yankee)

82/12/25 (computerese, often without the /)

Note the descending order on this last one making it easy to sort on the field. This is a military standard as well.

360 (Julian date, also computerese)

The Julian date is not accurate on leap years. (And you thought the Biblical scholars had a problem reckoning the coming.)

Any of the above conventions will work fine if the file manager is programmed to handle them. Most systems have a 'date' field that implements one of these. Some simply punt and expect you to fill in an alphanumeric string. That will work OK if there is some edit checking so the '/'s get in the right place and so on.

In writing this kind of stuff from scratch, I find it best to treat day, month and year as three separate fields with separate edit checking on each. That allows the '25 Dec 1982' form, which happens to be my personal favorite (compact, ascending order, no month/date ambiguity).

The things you need to check for in a date field are:

a. A format you can live with.

b. Storage as a string (see the zip code discussion above.)

c. Edit checking that rejects attempted inputs of the 13th month or the 43rd day. The sophisticated edits know about February and leap year, but unless you compound interest daily, that probably is not necessary.

My recommendation is that you find a file manager that stores all data as strings. This gets you several benefits:

a. Files can be TYPEd right from the operating system.

b. A text editor or DDT can be used to do emergency surgery.

c. If you bomb a disc, like I recently did, you can use Ward Christensen's Disc Utility, or the PFM monitor, to find and read the data for which the directory is missing.

Lesson 2—Reconfiguration

This problem has plagued anyone who has ever worked with a file manager.

After Dave gets all his programming done and all of us subscribers entered, he thinks, 'Wouldn't it be a good idea if I knew who had ordered which user discs.' He wants another field, folks.

That means updating the original program (first piece of frustration), writing a transfer utility (what a waste, you will only use it once), and transliterating all that data into a new file (ulcer time). This is the major reason why corporate execu-

(continued on next page)

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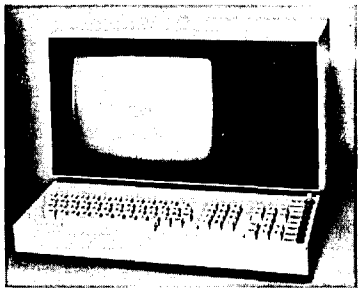

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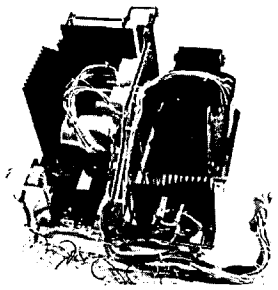

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(Data Base Handlers continued)

tives damn the computer and call the programmers incorrigible bastards (and other related but less printable names). Conversely, the programmers and analysts rightly recognize the execs as capricious and arbitrary (do they REALLY need this?).

Look for the ability to reconfigure data files in any system you buy (or write). One of the slickest I've seen uses a directory file to store the file structure. Simply create a new file structure and copy from one file to another. This prototype system that I am describing allows you to add or delete entire fields, lengthen or shorten existing fields, or change their order within the record. What a heartburn saver!

Lesson 3—Transferrability

In another few months you will have worn out your big board and will want the data on a system based on Steve Ciarcia's 8088 single board computer. How to get the data from one system to another?

There are several ways to skin this cat, most of them with some hangups. Look for a section in the manual that may be titled 'Foreign Files'.

Some systems can handle straight text files from disk. Look also for the ability to route output to disc as well as the printer. This will allow you to turn your data file into another pre-formatted data file ready for the new system. Look for a file manager that will take input data from (1) the keyboard (they all do), (2) a modem port, (3) a disc file (by far the most important for our mobility discussion).

My prototype system lacked some of the above features, but I was able to get around most of them.

An example: I had a file system that I had labored mightily to write in Pascal. The records were stored as a 'file of records' which was a text file, but sans carriage returns and line feeds.

The data system that I wanted to transfer the file to needed straight text files plus a leader character. Additionally, the file needed a header record that contained the record length and file size.

I transferred the file into the correct format, added the header record with DDT and copied into a properly formatted file and presto. It cost me a Sunday afternoon, but that was a lot quicker than rewriting the program or reentering the data. Plus, now I know how.

Loose Ends

Data mobility is one aspect of a file manager or data base system that is important. Several other subjects also should be understood both by users and programmers. Some issues:

a. Different data types. I have discussed the method of storage with a recommendation for pure string representation. But to the user, data needs to be presented as alphanumeric, numeric, date, and tabular to name just a few.

b. Edit checks. Each data type must be able to have restrictions added so that patently illegal data is rejected. Edit checks cannot idiot-proof a data file, but it can reject the dumb errors.

c. Physical data storage. Will the file fit in RAM, or on disc? This opens up a whole Pandora's box——can we afford the volatility of RAM storage of a data file in order to gain speed? Or should we accept a speed loss to put the file on disc? Can a Z80 with 64K RAM with a disc drive or two with say a meg of storage manage a respectable data base at all? If I get the demand (hint, write me or the editor . . .), maybe I'll try this subject as the next article.

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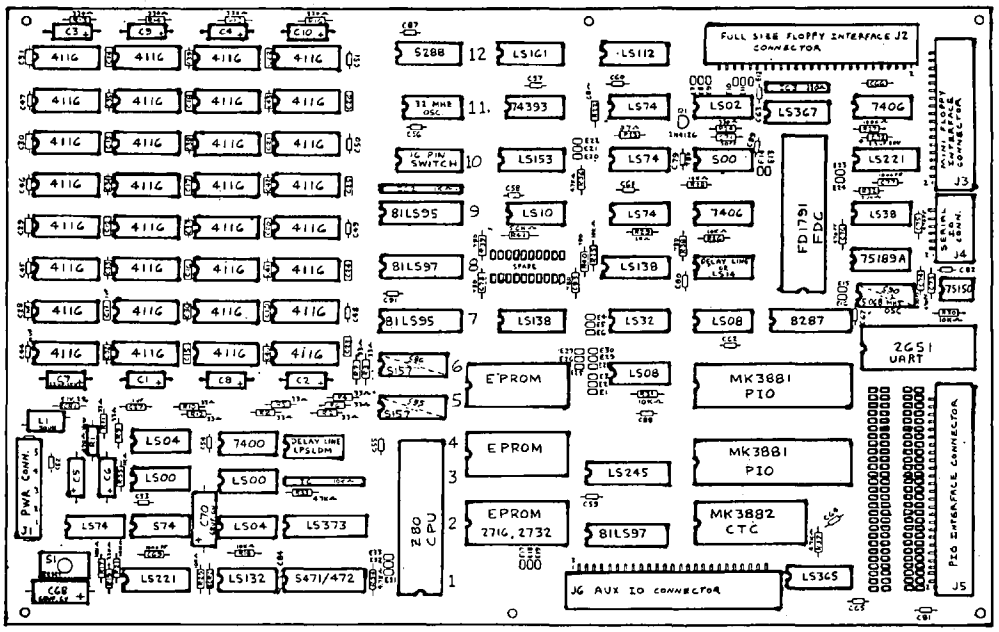

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FORTHwords

Column by Arne A. Henden

7415 Leahy Road
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Last column we discussed a simple random number generator, and applied it to a game. This time around we'll cover MX-80 programming, and in the next issue we will apply the program to a typing task. But first, a few words about the latest happenings in the FORTH world.

Vendors

I recently received a copy of the Idaho ROM FORTH User's Manual. Ingerson and Buvel of the Physics Department at the University of Idaho have developed a replacement for the PFM monitor that is a really nifty use of FORTH. The PFM jump table is retained, but many new monitor features have been added, such as disk copy, CP/M system copy, track read/write, RAM verify, standard 16- and 32-bit arithmetic, and FORTH defining functions. The IFORTH compiled code is available on disk from Univ. Idaho. It can be run from disk or burned into 4 EPROMs for permanent installation in the Big Board.

Editor's note: User disk #18 contains the complete IFORTH package as well as fig FORTH and every other scrap of FORTH related material I could find. The FORTH disk is not full but then no one seems to write anything very large in FORTH (very frustrating). The disk is available for $15.00 from Micro C.

Hampton Miller is working on an interface between IFORTH and the Dyna Disk and should have his results available shortly. Tom Ingerson, Ray Buvel, and Jay Papillon worked on IFORTH. Jay will burn IFORTH into ROM for you if you send him 4 2716s and $35.00. Contact him at, 871 N Eisenhower, Moscow Id 83843, 208-883-0847 (evenings).

New Products

Triangle Digital Systems (London) uses FORTH on their TDS900 SBC. This $180 board is an all CMOS Eurocard design, utilizing a 6301 microprocessor. The software includes a full screen editor.

You already know about the BASIC-on-a-chip microprocessors such as the Z8. Several manufacturers are now starting to ship samples of their FORTH-based chips. Three that have already been announced are the Rockwell RF611-12 (a 6502 with FORTH mask-programmed into 3K bytes), the RCA 1804N (2K byte), and the TI TMS7000.

The holdup to date has been the limited on-chip PROM space (usually 2-3K bytes). The manufacturers listed above have circumvented this limitation by placing key run-time routines in the mask-PROM, with an outboard ROM to provide I/O and user functions. I've also heard that a single-chip FORTH microprocessor with FORTH as its instruction set (an object-oriented processor like the iAPX-432) is soon to be announced. Stay tuned!

Interrupt Handling

The December column (issue #9) described a high-level interrupt handling routine. There were some vendor-specific parameters that were not adequately mentioned.

NEXT-LINK is the address of NEXT in UNIFORTH. 'NEXT-LINK 1+' bypasses one of the initialization instructions needed for UNIFORTH; most FORTH systems can replace this with NEXT-LINK. PC! is the same as the fig-FORTH P! (since UNIFORTH is available for 16-bit systems, it has PC! and P! functions for 8- and 16-bit port store respectively).

The word INTERRUPT.SERVICE loads register HL with the interrupt routine CFA. Fig-FORTH uses BC for the Interpreter Pointer instead of HL. If you are not using the Z80-specific registers, then you won't need to save all of the registers upon interrupt. UNIFORTH uses almost every available register, which is why all of them are saved and restored by the high-level interrupt handler.

Using the MX-80

The MX-80 is perhaps the best dollar value in printers today, and the recently introduced FX-80 will extend Epson's domination of the low-end printer market. Screens 1 through 3 show how you can set most of the parameters for the MX-80 from FORTH.

This menu-driven program is designed around the basic MX-80, and should be usable with minor changes if you have GrafTrax installed. As you can see, user-friendly interfaces are not difficult in FORTH. These routines assume

```
SCR # 1
  0 ( *** EPSON SETUP UTILITY *** )
  1 : +PREMIT  ( n --- ...add 128 then emit to printer)
  2      128 + PREMIT ;
  3 : RESET  ( reset printer)                        24 +PREMIT ;
  4 : TAB  ( horizontal tab)                         09 +PREMIT ;
  5 : COMPRESS:ON ( turn on compressed mode)          15  PREMIT ;
  6 : COMPRESS:OFF  ( turn it off)                   18 +PREMIT ;
  7 : DSTRIKE:ON  ( double strike mode)  27 PREMIT 71  PREMIT ;
  8 : DSTRIKE:OFF  ( turn it off)        27 PREMIT 72  PREMIT ;
  9 : EMPHASIZE:ON   ( emphasize mode)   27 PREMIT 69  PREMIT ;
 10 : EMPHASIZE:OFF  ( turn it off)      27 PREMIT 70  PREMIT ;
 11 : VSPACE  ( --- ...set vertical spacing)
 12    27 PREMIT 65 PREMIT CR
 13    ." Enter spacing in 1/72 inch increments (12=single): "
 14    GETNUM +PREMIT 27 PREMIT 50 PREMIT ;
 15 -->

SCR # 2
  0 ( *** EPSON SETUP UTILITY -- 2 ***)
  1 : FORMLENGTH  ( --- ...set form length)
  2    27 PREMIT 67 PREMIT CR
  3    ." Enter form length (default=66): " GETNUM
  4    PRECIS @ 0< IF 66 THEN PREMIT ;
  5 : HTABS  ( --- ...set horizontal tabs)
  6    27 PREMIT 68 PREMIT BEGIN CR
  7    ." Enter tab, <cr> ends: " GETNUM  PRECIS @ 0>=
  8    WHILE +PREMIT REPEAT 0 +PREMIT ;
  9 : VTABS  ( --- ...set vertical tabs)
 10    27 PREMIT 66 PREMIT BEGIN CR
 11    ." Enter tab, <cr> ends: " GETNUM PRECIS @ 0>=
 12    WHILE +PREMIT REPEAT 0 +PREMIT ;
 13 -->
 14
 15
```

that you have: a PREMIT function that passes characters to your printer in the same manner as EMIT works with the console; a GETNUM routine similar to one described in an earlier column; and a multi-branch CASE statement.

The UNIFORTH CASE statement actually works better with random choices; the Eaker CASE (used by Laboratory Microsystems and described in FORTH Dimensions) would be a better choice for this kind of menu. PRECIS is a conversion flag and is used here only to test if a number was entered. You can replace it with an explicit number entry and check instead of a carriage return.

Next column

I've read several new FORTH books (*Introduction to FORTH, Discover FORTH,* and *Programming in FORTH*), and will review their good and bad points. (Hint: *Starting FORTH* is still the best FORTH text). The monthly application will show how to make your printer function as a typewriter with a memory. Until then, good luck and FORTHwords!

■ ■ ■

```
SCR # 3
  0 ( *** EPSON SETUP UTILITY -- 3 ***)
  1 : MENU  ( this is the printed menu)
  2    CR ."   TO GET OPTION                ENTER "
  3    CR ."   Reset printer                  0"
  4    CR ."   Compressed width (16.5cpi)     1"
  5    CR ."   Normal width (10cpi)           2"
  6    CR ."   Double strike                  3"
  7    CR ."   Single strike                  4"
  8    CR ."   Emphasized                     5"
  9    CR ."   Non-emphasized                 6"
 10    CR ."   Set form length               7"
 11    CR ."   Set horizontal tabs           8"
 12    CR ."   Set vertical tabs             9"
 13    CR ."   Set vertical spacing          10"
 14    CR ."   Return to FORTH               <cr>"
 15    CR ." Enter option number: " ;      -->

SCR # 4
  0 ( *** EPSON SETUP UTILITY -- 4 ***)
  1 : EPSON  ( the main word)
  2    BEGIN MENU GETNUM PRECIS @ 0>= WHILE  CASE
  3      0 =:  RESET          ;;
  4      1 =:  COMPRESS:ON    ;;
  5      2 =:  COMPRESS:OFF   ;;
  6      3 =:  DSTRIKE:ON     ;;
  7      4 =:  DSTRIKE:OFF    ;;
  8      5 =:  EMPHASIZE:ON   ;;
  9      6 =:  EMPHASIZE:OFF  ;;
 10      7 =:  FORMLENGTH     ;;
 11      8 =:  HTABS          ;;
 12      9 =:  VTABS          ;;
 13     10 =:  VSPACE         ;;
 14     CASEND REPEAT ;
 15 ;S
```

EPSON MX-80

Review by Arne Henden

7415 Leahy Road
New Carrollton, Md 20784

Model: MX-80
Manufacturer: Epson America, Inc.
3415 Kashiwa Street
Torrance, CA 90505
List Price: MX-80 $595 MX-80 F/T $695

When I bought my Big Board 18 months ago, I intended to use it largely for word processing. So I scoured the magazines to find an inexpensive printer that had the basic requirements: speed, lowercase descenders, sheet feed, graphics and low price. Six months earlier, Centronics had the market locked up and didn't meet the criteria. But Epson appeared and rapidly became the leading marketer of printers because they did fit the bill.

Strengths

Epson has made a real workhorse of a printer. Mine has been in constant use over the past year with no hint of failure. I suggest you only buy the printer with the Graftrax option (G). Not only do you get dot-addressable graphics, but in addition Epson includes italic print, sub- and super-scripts, and many more printer commands.

One of the highlights of the MX-80 is its manual. For once, a Japanese firm had the foresight to contract with an American consulting company to write its English-language manual. David Lien (Compusoft, Inc., San Diego) has written an excellent manual that covers all of the commands without assuming that you are an Epson service representative. It is 200, 8½ x 11", spiral bound, pages in length, and reminds me of "Starting FORTH" when reading it. Brodie and Lien write like they are brothers.

The MX-80 will print at 5, 8.5, 10 and 17 cpi in standard, italic (G) and sub/superscript (G) modes. Each mode is supported in single, double and quadruple strike. Graphics (G) resolution is 80 dots/in, with very good registration. To enter the graphics mode, the user issues the graphics command plus the number of horizontal dots to print. The printer then accepts that many bytes of data before switching back to character mode. Each byte controls 8 wires of the print head, meaning that you print 8 lines of horizontal dots at once. If you don't purchase the Graftrax (G) option, 64 block graphic characters are available.

Weaknesses

On the negative side, the Epson is noticeably slower than is the competition, with an advertised speed of 80 cps but an actual throughput more like 40 cps. The typestyle is not typewriter quality; instead, it is quite plain and square. To me, this is the largest negative factor for the MX-80. The IDS and NEC printers are much prettier. The basic MX-80 does not take single sheet paper. The form feed action is very slow. The dip switches to change printer configuration are deep inside the printer and require considerable dismantling to set. On the other hand, the printer ribbon is exceptionally easy to change, and the print head is user-replaceable.

Conclusion

I really like the printer and know many friends that feel the same way. Check it out first, and then compare with the competitors to make your final decision.

■ ■ ■

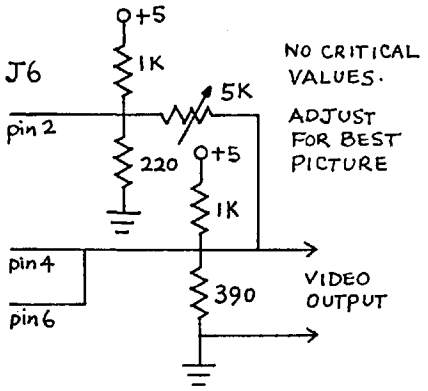
LETTERS

Dear Editor,

The article on interfacing CDC drives in issue #8 was a useful guide, however, there appears to be an error on diagram 3. HDLD1 and HDLD0 (head load) are on pin 26 instead of pin 36 (as indicated in the diagram).

My converted television set did not like the composite video output from the BB. The screen had vertical bars and bad ghosts. The following cured the problem.

Wesley Ebisuzaki
550 Memorial Dr 16E
Cambridge MA



Dear Editor,

Folks looking for a 9" hi-res Motorola monitor which accepts composite video should check with Acme Electronics, 224 Washington Ave. N, Minneapolis, MN 55401 612-338-4754. They have no cabinet and require 12V at .8 amp but they are new and only $59.00 plus $5.00 shipping.

Tom Mason
2402 Audubon Rd
Akron, OH 44320

Dear Editor,

I'm working on a high resolution graphics add-on board for the BB I. It has its own processor and connects via the parallel ports. If anyone else is working on graphics hardware or software, please get in contact with me.

Robert A. Van Winkle
11497 Sandpiper Way
Penn Valley, CA 95946

Dear Editor,

Now that CP/M 3.0 is just around the corner, I'm wondering which brave souls are going to write a BB I or II CBIOS for it. In the banked mode, the operating system requires 96K of RAM minimum but can talk to a good deal more.

I'm presently looking at an application that would be immeasurably speeded up by the additional RAM space since the space can be used as disk data buffers.

I'd appreciate hearing from anyone working on this or planning to go this direction.

Jim Totten
700 N Melborn
Dearborn, MICH 48128
313-561-6794 after 6pm EST

Dere Editore,

I wuz so pleezed to see yor add 4 a spellin checker. I reeley kneed won. Enclozed yu'll find a cheek 4 $29.95.

Congratulations (I luked thet won up) on gettin MicroGroup (red it from the add) off on the rite fut. I am busy with Easy Calc and hop we cun add it to yur oferings reel soon. I'll keep yu posted on devlopmints. Thanx and gud luk.

X

Editor's note:

Dear X, I can see immediately that you have a large amount of raw writing talent (you did spell "X" correctly).

If you use SpellSys regularly, you may have a chance to bribe your way into "Lonny La Lonzo's Famous Writing by Mail School." You should contact them quickly though, they may soon be shut down for mail fraud. (Some people just can't handle fame.)

Another way for you to develop a vague familiarity with English is to write a large technical manual. However, there is no guarantee that this method will work.

We'll be contacting you for a review of SpellSys.

Dear Editor,

Being a rank amateur, I had trouble incorporating the E8BIOS from user disk #9 into my CP/M. I was faithfully (blindly) following Jim Simon's "Changing your BIOS" instructions in issue #8 page 17—including step 11 which is a DDT read command with offset (R3780). Well, when E8BIOS.HEX executes, it also offsets by 3780. The cure is to enter only the "R". The E8BIOS works beautifully with my Diablo 1640.

I am a cement plant accountant and am working on replacing my pad and calculator with a computer. Now I can get down to the business of learning how to use word processing, spreadsheets and CP/M. Also hope to add double density and a RAM disk in the near future.

John Allen N0JA
144 Yagi Lane RR #1
Bowling Green, MO 63334

Dear Editor,

DRC is now selling the BB kit for only $319 and the bareboard for $119!!! I still remember when the kit was $699. DRC is also offering a BB software package for $149—the software comes from CDL. By the way—why does DRC take so long to fill its orders? I've ordered three S-100 memory boards, as well as the bare Big-Board, from them and nothing has reached me in less than 6 weeks. (And the S-100 boards were shipped Priority Mail! I would have gotten the boards quicker by stage coach if only DRC had shipped them the day they received my order.)

Boy am I pleased with the Big Board, though. It was up and running in no time, and has been running reliably ever since. I like DRC's products but their service stinks.

Here are my experiences on disks. I use IBM diskettes almost exclusively. Yes, they're expensive, but if you ask me they're worth it. They cost $47.50/box in quantities of 1 or 2, $40.00/box for 3 or 4, and $37.50/box for 5 or more boxes at the IBM Product Center downtown (Philadelphia). I recently converted 5 Verbatim disks to flippies and 2 of the 5 had bad sectors on the back side (though I had no problems with the front sides).

I bought some Jade disks, and though I haven't had any bad-sector problems, they make so much noise when they're in the drive that I keep thinking there's a war going on behind the little red drive light. I now use the Jade disks only for backup and mailing.

Speaking of Jade, as with SRA David B Burgess (see the letters in Micro C #9), I too had a bad experience with them. After sending me a faulty VERSAFLOPPY II double-density disk controller board (that was supposed to be assembled and TESTED) they informed me that the in-warranty repairs would take 2-4 weeks. Well, after they received my board, they sat on it until the warranty period expired, then sent it to SD Systems for repairs.

SD Systems stated (correctly) that the warranty period had expired, and thus they charged Jade for the repairs. Jade, in turn, put the charge directly on my VISA card (without my permission) then proceeded to send the board back to me by UPS ground. (I had requested, and paid accordingly, for the board to be sent UPS Blue Label Air.) This whole fiasco took over three months, and I was left with repair charges and a large telephone bill.

I now have an oscilloscope (which I finally purchased because of some more problems with the VF II board) so I can state quite confidently the the PLL circuit is screwed up.)

About those Teletype power supplies from B.G.Micro—I bought the identical supply for the identical $67.50 from Bullet Electronics in Texas, but they sent me the 24v modification parts, the AC line connectors, schematics, modification instructions, and a theory of operation absolutely free. They also promised to send me a service manual for the supply when they received them. That's what I call a great deal. My power supply worked the first time I plugged it in, and like yours, it's as solid as the rock of Gibraltar.

I ordered Aztec C II for the special Micro C subscriber price of $149 about a month ago. I've been in love ever since. Boy is it great to have a complete UNIX 7 C to program in.

I do almost all my editing with VEDIT, though I only have their mini version (Mini-Vedit 3.31 to be exact). It doesn't have the fancy features like word-wrap or all the text buffers (only 1, not 10), but it's still quite powerful, and for writing programs its almost unbeatable. I also have Wordstar, but those HELP screens and all the disk-banging drives me crazy. Yes, I know those HELP screens can be made to disappear, but once they're gone I have no idea what any control key does. VEDIT is simple and fast. $49 for the mini version is a steal.

A neat book is *Mastering CP/M* by Alan Miller (of *8080/Z80 Assembly Language: Techniques for Improved Programming* fame). It's put out by Sybex, copyright 1983. (How'd they manage that? I bought the book the week after Thanksgiving.) This book is really a huge macro library containing routines for just about anything you'd ever want to do in assembly language in the CP/M environment.

Don Brittain
4200 Spruce St. Apt. 208
Philadelphia, PA 19104

■ ■ ■

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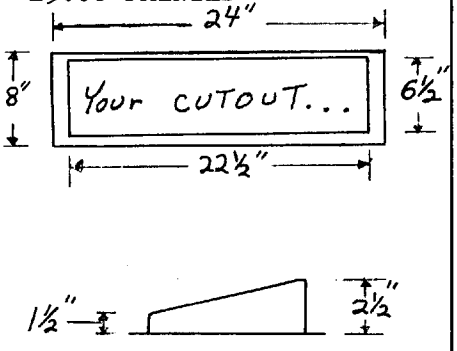

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Pascal Procedures

Column by John P. Jones

6245 Columbia Ave.
St. Louis, MO 63139

I had planned to give a preliminary report on JRT PASCAL Version 3.0 by this time but as is the case with most software products, the release date was postponed. I hope to have a full report by next issue.

Before we continue with our look at the language I have a few comments on PASCAL textbooks. The last time I was at a major bookstore, I must have found at least twelve volumes which dealt with PASCAL and PASCAL programming. Many dealt with specific versions of the language but most were designed to teach 'standard' PASCAL. Someone wanting to learn the language has the problem of trying to decide which one or two texts will be best to purchase.

Without going into detail, I would recommend the following: For those without much experience in any programming language, *Introduction to PASCAL* by Rodnay Zaks, Sybex 1981. The text is designed as a tutorial in the language and even the beginner should have no trouble with it.

For those wanting to learn PASCAL as a second language, *Programming in PASCAL* by Peter Grogono, Addison-Wesley 1980 is a better choice. The explanations and examples in this text are on a more technical level, more suited to the experienced programmer.

Finally, as a reference to the language, *The PASCAL Handbook* by Jaques Tiberghien, Sybex 1981. All of the above should be used along with whatever documentation you got with your PASCAL compiler. Unfortunately, all of the implementations of PASCAL deviate from the standard and one another enough that there cannot be a truly general text or reference.

Data Types

One of the strengths of PASCAL is its variety of data types.

The pre-defined simple data types are INTEGER, REAL, CHAR and BOOLEAN. Integers are 16-bit signed numbers in the range (-32767 ... 32767). When written as constants, no decimal point is allowed (0, 3, -24, +769). Real, or floating point numbers are implementation dependent in their range and precision. Precision can be from as few as 6 to as many as 14 digits. When written, the value MUST have at least one digit preceding the required decimal point (0.1, 13.809E+12, -6.4).

Boolean variables are the objects of relational expressions and can take on the values TRUE or FALSE. Type CHAR is used for 8-bit characters such as 'B', '1', '(', '6'.

Some PASCALs have extensions providing additional simple data types. For example BYTE is an 8-bit integer in PASCAL/MT+ and LONG_INTEGER is a 32-bit value in PASCAL/M.

The above simple data types are fixed in their properties. The other data types available have some of their properties defined by the programmer.

Scalars

A scalar or enumerated type is defined by a list of all the possible values for that type.

```
TYPE day = (mon,tue,wed,thu,fri,sat,sun);
```

The enumerated values become ordinal constants of that type, the first value being ordinal 0. Thus ORD(thu) = 3. The values cannot be written directly; you must use the ORD function. Scalars can be used for array indices, loop control, CASE switches and the like.

Subrange types are defined by two constants.

```
TYPE small_integer = 1..10;
     lowercase = 'a'..'z';
```

The associated scalar type is that of the constants in the declaration and any operations valid for that type will be valid for the subrange.

SETs

A SET is a collection of objects of the same type.

```
TYPE week = SET of day;
   weekend = SET of [sat,sun];
   weekday = SET of [mon..fri];
```

Set variables can be assigned, compared and otherwise manipulated using conventional set algebra. The symbols +, -, *, >=, <= and IN are used for union, difference, intersection, contains, is contained by, and inclusion respectively.

ARRAYs and RECORDs

ARRAYs and RECORDs are the structured data types of PASCAL.

An ARRAY is a collection of data elements, all of the same type, accessed by an index (subscript).

```
VAR
   name : ARRAY[1..30] of CHAR;
  screen : ARRAY[0..23, 0..79] of CHAR;
  matrix : ARRAY[1..10, 1..10] of INTEGER;
daily_pay : ARRAY[week] of REAL;
```

A multiply-dimensioned array is in effect, an array of arrays. Array elements do not have to be simple types.

A RECORD is a grouping of related data elements (fields) which can be manipulated as a unit. The component data items are accessed by name and can be of different types. Variant records in which a portion of the record can have different components will be considered in a future article.

```
TYPE entry = RECORD
        date : integer;
        name : array [1..20] of char;
        ssno : array [1..8] of char;
      salary : real;
end;
```

Most PASCALs have an additional pre-defined data type, STRING. The type declaration for STRING would look like this:

```
TYPE STRING = RECORD
  current_length : 0..max;
           value : array [1..max] of char;
end;
```

Default max is usually 80 characters, and absolute max is usually 255. (JRT PASCAL allows strings up to 65,535 characters since the dynamic length is stored as a 16 bit value)

```
(*name limited to 30 chars*)
   VAR name : STRING [30];
(*use default length of 80 chars*)
      address : STRING;
```

Strings can be read, written, compared and handled much like other data. Individual characters or sub-strings can be manipulated by subscripting into the char array and most compilers will have a set of pre-defined procedures and functions to simplify string handling.

In many applications, the size of the database to be handled will be unknown or variable. With most other languages, the software will have to be written to allow for the maximum possible number of data items. For instance, a BASIC program for analyzing a year's checkbook entries might have the statement:

```
nnDIM C3(12,100)
```

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which would allow for 100 checks for each of the 12 months. If more than 100 checks are entered for any month, the program will likely bomb. On the other hand, if fewer than 100 checks were written in any month or if the analysis is for less than a full year, the extra storage is wasted. PASCAL provides a method for the dynamic creation of variables at execution time. Dynamic variables are accessed through a pointer variable, bound to a particular data type. The statements:

```
TYPE word_ptr = ^word;
          word = record
       spelling : string[15];
         sound : string[12];
         before,
          after : word_ptr;
end;
VAR base, current : word_ptr;
```

Define the type word_ptr to be a pointer to a dynamic variable of type word. Type word is a record, two fields of which are pointers to additional variables of type word. (PASCAL allows pointers to be defined before their target types have been specified to allow for just this kind of recursive definition.) The variables associated with 'base' and 'current' do not actually exist until created by the built-in procedure NEW(). The statement: `NEW(base);`
will create a variable of type word, and base will then point to that variable. The expression, baseCTRL, means 'the variable pointed to by base' and is used to access the newly created variable.

```
base^ .spelling := 'hello';
```

Because pointers can point to records, and fields of records can be pointers, all kinds of linked list structures (rings, trees, queues) can be built at execution time. The example above could be used to build a binary tree of dictionary entries for a text-to-speech conversion program. The pre-defined value, NIL, is recognized by the compiler for null pointers, i.e. pointers that don't point to anything. Finally, the procedure DISPOSE(), releases the storage allocated to a dynamic variable. As for all variables in PASCAL, values are meaningless until they are assigned. To start a dictionary as above:

```
(*create the variable*)
        NEW(base);
(*then assign its values*)
      base^ .spelling := 'hello';
       base^ .sound := '*-bzQ#';
       base^ .before := nil;
        base^ .after := nil;
```

This newly created node has no branches.

```
NEW (current);
base^ .before := current
```

would add a branch to the tree.

Be careful when you begin using dynamic variables,

```
NEW (currant);
NEW (currant);
```

will create two new variables of type word, but one will be inaccessible.

Much of what we've covered in this installment may take a while to sink in (it did for me). The best way to learn a language is to actually write programs. At the start, you'll make a lot of mistakes, and the results may not be what was intended but after a while you'll find that success becomes more frequent.

Get a text, and/or a book of PASCAL application programs and use them to expand on what's been presented here.

Next time, we'll look at loop and control structures.

■ ■ ■

KayPro Column

By David Thompson

The first impression you get when you look at small systems like the KayPro is that all systems should have the small drives. I mean, 8" seems large and clumsy compared with the little disks and drives.

However, after fighting a flaky drive or disk for a few hours you learn that with the smaller drives you need to back up your work about every hour (or sooner) and to back up the backups.

The KayPro may have been more prone to drive problems than some. The drives are Tandons, certainly not a name to be taken lightly, but it appears that Tandon isn't taking as much care manufacturing and aligning these drives as they do with their 8". I've had a number of dealers comment (not favorably) about the Tandon 100s. Anyone who has experience realigning the little units should get in touch with me as soon as possible. There are a lot of people desperately waiting for such info. On the other hand there are many things blamed on drives that may not be drive related, and in fact, the following fix for "drive" errors doesn't involve the drive at all.

Drive Fix

The clock to the 1793 was slow (with respect to the processor) by about 40 nanoseconds, and that made setup and hold times critical. It turns out that with a little heat, the times got too critical. So the mod:

Remove U87 (74LS390). Cut pin 9 (or bend out), also bend out pin 1. Jumper pin 1 to pin 6. Jumper pin 12 to pin 15. Put the 74LS390 back into the socket, making sure that pin 9 and pin 1 are not making contact with anything. (If you bent out pin 9, make sure that it is not touching the resistor lead next to the socket.) Be sure that you don't get any solder down on the parts of the pins that go back into the socket.

This mod is now being done at the KayPro factory so you might take a close look around U87 for signs of jumpering. If there isn't any and you are getting drive errors, then this mod is probably just what the system ordered.

New ROMs

We are selling new character and monitor ROMs for the KayPro. The monitor provides both a non-blinking cursor and 5 retries on a disk read error. The new character ROM contains our new BB character set plus the Non-Linear Greek set (or blanks in place of the special characters).

Reading other 5" disk formats

A software package called UniForm sets up the KayPro to read, write, and format disks for:

Osborne 1, SD and DD
Superbrain
NEC 8001A
Xerox 820, SD and DD
TRS-80 MOD 1 SD
Morrow Micro Decision
Heath with Magnolia, DD

UniForm contains two programs. One lets you format a disk in drive B to any of the above formats, the other lets you read or write any of the formats. You can run the programs on these other disk formats and you can PIP programs between these disks and the KayPro format disk in drive A.

The UniForm programs are completely menu driven so you don't need to refer to the manual. The user interface is well done.

Weaknesses

Drive A is always in KayPro format and you may only transfer files from the KayPro format to the other formats using PIP which is quite slow.

It would be much nicer to be able to select a special format for both drives, and if the format were the same, be able to do a fast track by track copy between the two drives.

It also would be nice if the program smartened up the BIOS enough so the system could automatically figure out a new disk format and access the data with no operator intervention (just like SoftWare Publishers dual density package).

Anyway, there is a super demand for this kind of software and I'm sure a number of folks will follow along with new packages. Meanwhile, at $39.95 UniForm is certainly worth getting.

UniForm
Micro Solutions
125 S Fourth St
DeKalb, IL 60115

8" Drives for the KayPro

A couple of folks are working on an 8" drive interface for the KayPro II, and we've had numerous requests from users and dealers for information that they might use to help them make this mod.

Well, there is nothing so far, but things should be coming. There are a couple of options.

First, you could do away with the 5" drives altogether. Just modify the CBIOS for 8" and the drive cable for 8" compatibility and pick off 2MHz for the controller.

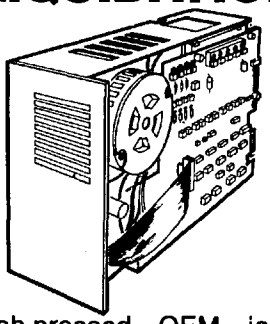
Second, you could add one or two 8" drives as drives C and D. This would take some additional table space for sector decoding, etc., but would be the most versatile.

Since the KayPro has a 1793 on board, you could make your 8" double density (670K per SS disk) but you'd have to speed up the KayPro to 4MHz to transfer data fast enough. (Unless you could figure our how Russell Smith did it at 2.5 MHz on the BB.)

Anyway, considering the calls we get about this, the demand here is pretty gigantic too.

■ ■ ■

WINCHESTER DISK DRIVE LIQUIDATION



Cash-pressed OEM is liquidating its inventory of new Shugart SA1002 8" 5.33 megabyte Winchester hard disk drives. These are sold un-used, as is, in original shipping boxes. **$380 each** plus $12 shipping. New Western Digital controller card for this drive, $350 each. Call LIQUIDATORS @ 803-877-9828 or send check to 105 S. Main St., Greer SC 29651.

PlannerCalc

Review by
Kenneth R. Schurr Jr.

P.O. Box 1136
Liberty, NC 27298

When Comshare Target Software reduced the price of their program "PlannerCalc" to $50.00, they declared that "the calc price war has just ended." If you need to make financial spread sheets, then this program is for you. If you want to do expense accounting or budgeting, then it's not, but more about that later.

What it does

PlannerCalc, (hereinafter referred to as PC), allows you to develop, view and manipulate financial models from a 'gridsheet' or 'matrix' screen approach. You can enter commands by line or column, using a large variety of arithmetic conditions, functions and operations. Any formulae or values used in calculations are seen and changed easily.

First some terms. A gridsheet is composed of a number of vertical blocks (columns) and horizontal blocks (rows). A cell is a single matrix position. It is the intersection of a column and a line. The locator is a movable block used to highlight the cell on the screen to which a command or value is being placed. There is a command line at the bottom of the screen where you tell PC what to do.

Capabilities

The program is very powerful; you can have up to 128 columns and 512 lines in one matrix. It's easy to communicate with; you talk to it in simple English statements, like:

```
COLUMN 1 FALL'82
COLUMN 2 WINTER'82
COLUMN 3 SPRING'83
COLUMN 4 SUMMER'83
COLUMN 5 TOTAL=COLUMN 1
  THRU COLUMN 4
LINE 1 UNIT'SALES=100, 200, 300, 350
LINE 2 UNIT'PRICE=4,5,6,6
LINE 3 REVENUE=UNIT'SALES *
  UNIT'PRICE
```

There're all kinds of logic that you can apply to cells. Besides normal adding, subtraction, multiplication and division logic, you can use min, max, average, cum, greater/less than, grow by, exponents, and these can be nested to build some very complex models. There is also a "net present value" feature for finding the profitability of one or more investments.

Features

Naturally, you can only see the number of columns on your screen that your VDT allows, but PC has horizontal scrolling, so you can scroll from one end of your model to the other. It even has two split-screen capabilities, vertical and horizontal.

The vertical split is useful when you want to compare two columns whose numbers have separated. It allows you to view any two columns next to each other. The horizontal split works the same way, allowing you to see two different parts of the model at the same time.

The documentation with this program is the best I've seen. There is a manual that is 1/2" thick, that leads you through step by step. They give you a sample model on the disk, which is used as example in the manual. And, as if that wasn't enough, the program has a HELP function that you can get on the screen at any time.

Printing your model is slick. You can have up to 10 lines of headings, at 80-characters each. Underline and blank lines are available, and if your model exceeds the width of your printer, it breaks it up into separate pages. You can also print the worksheet, which is a list of your commands. This is very handy for debugging a complex model.

What it doesn't do very well

There is an "INPUT" function whereby you can create a model, but use the word "input" instead of an amount in each cell. You can store this model and use copies of it to make additional models. The problem is that you have to use their editing feature to replace the "inputs" with amounts. Editing is awkward. First you have to hit the "D" key 5 times to delete the word "input," then hit the "I" key to insert the amount. This is really a drag.

Also, there is no way to take the results from one model and use them in another model. I wanted to use it for my expense accounting, but I can't get the ending balance from this week's model to be the beginning balance for next week's.

In summary, PlannerCalc is a great tool for doing spreadsheets. They have a more advanced model, called "MASTERPLANNER" that overcomes the limitations I've mentioned above, but that costs $325.00!

TARGET PlannerCalc
Comshare Target Software
1935 Cliff Valley Way, Suite 200
Atlanta, Georgia 30329
(404) 634-9535
Price $50.00 (plus $5.00 shipping)

Editor's note: PlannerCalc is being upgraded (according to Comshare) and the new version will sell for about $100.00. The $50 version will no longer be available. They sold something like 10,000 copies in the first month that it was available (for $50 per copy.) So, if anyone wants write a new super deluxe $50 spreadsheet program, here's your chance.

■ ■ ■

CP/M 2.2 License and disk for Scull-Tek Big Board **$95.00**
Reconfiguration of above for Ferguson Big Board or Xerox 820 ..... $10.00
CP/M manuals $20.00
C-DIFF file compare utility for CP/M **$29.95**
With an assortment of public domain utilities to fill the disk.
Wabash 8 inch SSSD diskettes ..... **10 for $30.00**
plus $2 shipping per box of 10

CP/M Public Domain Software Collections
Add $2.00 each to copy CPMUG, RCPM or SIGM disks onto new disks. Specify which disk numbers you want. There are over 200 disks full of public domain software available in these three collections. The best way to find out what is available is to order a box of 10 disks plus $20 for copying and specify that you want the catalogs and abstracts, which will fill all ten, then after you read the abstracts order the disks you have picked out. Quantity discounts and custom CP M configurations available. Send $1 for catalog which describes the above and other items in more detail

WILCOX • ENTERPRISES
Illinois residents add 5% sales tax.
CP/M is a trademark of Digital Research, Inc.
P.O. BOX 395 • NAUVOO, ILLINOIS 62354 • (217) 453-2345

Canned Lightning For Your Big Board!

If you're hot for speed and have a standard BB with a parallel interface, flash on this:
Anything CP/M does with a regular disk drive it can do 35 - 300% faster with dynaDisk.

dynaDisk is a 256k RAM board that runs on 5 volts and plugs into your parallel interface (J5). It comes with auto-patching software which makes it look like an 8" single density disk drive to CP/M. See December '82 issue of MC for more details.

dynaDisk comes in four flavors:

1. HOMEBREW: manual & software (on 8" single density disk)	**$35.00**
2. PARTIAL KIT: above plus PC board	**$95.00**
3. ASSEMBLED & TESTED: we put it together for you, burn it in for 48 hrs. & test it	**$495.00**

Allow 4-6 wks for delivery. CA residents add sales tax.
Send check or money order today to: CP/M is a trademark of Digital Research

L.A. Software

6708 Melrose
Los Angeles
California 90038
(213) 932-0817

EDITORIAL (continued)

biased review in this issue for more information about Dyna.

P.S. On Sunday, a number of BBers stopped back by the booth to say they had enjoyed the meeting (and to take another peek at the Dyna disk). Jim Simon presented me with a large (and delicious) grapefruit (more voice medicine). Anyway, to all those of you who were there, thank you for coming. It was a pleasure meeting you.

And, lest I forget, Jim Tyson was there distributing JRT Pascal version 3. I understand that sales were so brisk, he ran out of some disk formats on Saturday. So, it's coming, it's coming.

CP/M 3 and 256K of RAM

There is a lot of interest in the new version of CP/M especially because of the added speed you get with disk buffering etc. To take full advantage of version 3 you need more RAM and the BB I is ideally suited to expansion to 256K.

In this issue there is an article by Trevor Marshall covering his design for 256K and double density, among other interesting things. Trevor is using a BB I with a 160-Mbyte streaming tape as a bulletin board.

In issue #12 we will have a follow-up article by Art Boehm, covering (very thoroughly) how he came up with 4 banks of 64K chips.

Cheap Drives

Unfortunately, by the time Micro C #10 hit the streets, BG Micro had sold all its 801s and by the time my comments about their power supply made it into print they had sold out of those. However, for those of you who can use the slightly larger (not the standard R version) Shugart 801, there is still a real steal on the market.

Cascade Electronics of Randolph MN, 55065, is selling Shugart 800s for $99.00. These are like the full-blown 801s with the standard interface and all the standard jumpers. They run single and double density. The difference is that they have the older TTL style boards (service men prefer these boards) so they require -12V or -5V. Mine came jumpered for -12V. (Jumper "L" if you have -5V.)

I bought two and checked them out with the scope and the alignment disk. They were both right on and in beautiful condition. They are better drives than the new ones I bought for $400 each.

So if you can use the larger drives and don't mind the fact that they were pulled out of new, unsold commercial computers, and checked out on a BB before shipping, then this is definitely the way to go.

RS-232-C Test Board

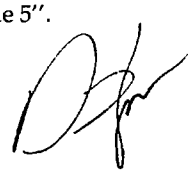
After I took a shot at ROMAC for their documentation on the ScullTek computer, I didn't expect to hear from them. As you will see in this issue's ads, I've heard from them. They say that they have greatly improved the manual on that board (I have to take their word for it because I haven't seen it yet). They are also selling two other products: a terminal board that sounds neat (there are some very nice programs written to run on the Heath terminal), and a really zingy little serial test board.

I ordered the RS-232-C line check board complete with parts. It takes about 10 minutes to build and at $25.00, it costs less than 1/4 as much as any other units I've found. Plus, it's really handy. Probably half of the serial printer problems are a result of electrical misconnections.

If you insert pins into the extra holes provided on the board and cut the traces between the male and female sockets, you can make this little unit into a real RS-232 breakout box. This way you can try out any conceivable interface arrangement very quickly. Then you can build a custom cable knowing it will work.

CPMug

For those of you interested in contacting the CP/M Users Group, the address is: 1651 Third Ave, New York, NY 10028. The price of each CPMug volume is now $13 for 8" and $18 for Northstar and Apple 5".



David Thompson
Editor & Publisher

WANT ADS

The following folks are reaching you for only 20 cents per word. If you would like to reach the same audience, send your words and 20 cents for each to Micro Cornucopia.

RENT SOFTWARE!
Hundreds of public domain software programs available - copy it yourself & save!!
CP/M USERS GROUP, Vol. 1 - 80
40 Disks..... $30.00
SIG/M USERS GROUP, Vol. 1 - 60
30 Disks..... $30.00
Get both for just $50.00
"FLIPPY" Disks (use both sides)
with order $3.00 each

RENT TEST EQUIPMENT!
Align & repair your own disk drives with our equipment & technical data. Amaze your friends and save money too!!
7 days..... $100.00

CALL (619) 727-1015
HAVE CREDIT CARD READY
PJS CO.
933 S. Santa Fe, "C" Vista, CA 92083

BIG BOARD I - must sell to help pay $1000 tuition. Fully loaded, runs great. Make reasonable offer.
Reldon Ravellette
Rt. 3, Box 115-D
Siloam Springs, AR 72761

The Get Together

We are already getting calls from folks all over the U.S. who are planning to come to the second annual Semi-Official Get Together here in Bend, Oregon, July 30 and 31.

The standard questions are: "What's the weather like in July?" "Where's the nearest airport?" and "Do you have a Holiday Inn?" Well, the following should give you some idea, and if you'll call or write, we'll send out some more details (in four-color).

Weather

Summer days are usually 85 to 95 and very dry (not muggy). We are at about 4000 feet elevation between the high Cascades and the high desert so it doesn't get sweaty, sticky, hot. (In fact, 90 feels about the same as 80 does in the valley.)

The night time lows range between 35 and 45 with occasional frosts. So, bring a sweater you can put over your warm weather clothes.

If you plan to do some backpacking into the Three Sisters Wilderness (twenty-five minutes drive from the house), bring warm clothing and warm sleeping bags.

Transportation

The nearest commercial airport is Redmond, just 13 miles from here. It used to take us 40 minutes to get to the Portland Airport from our house in Portland. It takes us 20 minutes to get to the Redmond Airport.

Republic Airlines flies into Redmond. There is also a daily shuttle van between Bend and Portland International Airport. It gets to the Portland airport at 9 a.m. and leaves Portland for the return trip at 4 p.m. ($23 each way).

Hertz and National rent cars at the Redmond airport and there is an inexpensive limo service that takes you anywhere you want to go in Bend.

Lodging

Bend has a plethora of places to stay, ranging from the plush resorts (complete with river running, horseback riding, tennis, fishing etc. $38-$60 per night), to plain (but nice) motel rooms for $15.95.

A couple of miles outside of town is a state campground which has full facilities for tenting and trailering, including solar-heated showers and trout fishing. It is only $8.00 per night.

Plus, we have a large yard (for all in tents and purposes).

Goodies

Already there are some indications of the kinds of things we'll be doing here. Trevor Marshall is hoping to bring a system along. It will be a Big Board with 4 banks of 64K dynamic RAM and 160 MBytes of streaming tape, divided up into 8 MByte pseudo disks. (And it's not that much slower than a floppy.) He's already using such a system for a bulletin board.

A very famous person may have a whole new system to show. I can't say anything more than that—even though I know none of you would breathe a word of it if I told you.

Hopefully someone will bring an operating copy of CP/M 3 along with some copies of the CBIOS. (You could be a very well-loved person.)

I should have a graphics display running on either the BB or the KayPro that you can play with. And, of course, Dyna will be here. Tony Ozrelic (LA software) and his wife are planning to come so you might just take home your own Dyna disk.

You folks with hardware and software for trade or sale should definitely bring along some goodies.

Activities

There are a number of really fine short trips you can make from here. Local guides will be glad to take you out sailing, kayaking, river running, fishing, backpacking, bicycling, you name it. The Bend area is internationally known as one of the most beautiful and varied recreation areas in the Northwest, so plan to stay a few extra days and enjoy.

■ ■ ■

$29.95 SpellSys

Are you signing your name with an X because spelling doesn't come easily?

Then you need SpellSys!

With this full-feature package, you can write prose with the pros. SpellSys features a 42,000 word dictionary and all the bells and whistles of those expensive checkers—including rhyming, crossword search, letter unscrambling, etc.

SpellSys is made up of a group of individual programs which you can use together or separately. With SpellSys you can setup and maintain your own custom dictionary (in addition to the main dictionary). These are real dictionaries, not hash tables, so you edit or remove words from your own dictionary at will.

IT'S EASY TO USE!
Just enter "SPELLSYS", select which disks you'll use, and file you're checking. Then SpellSys takes over. Everything is self-prompting—so sit back and relax.

Word Review Operations
C . . show Context in file
L . . Lookup word in dictionary
M . . Misspelled (correct file to.....)
D . . put in user Dictionary
I . . Ignore
N . . Next word
P . . Previous word
E . . Exit review
? . . (or any other key) displays menu

ORDER AT NO RISK!
Check out the manual and if you don't agree that SpellSys is a super bargain, just return the package with the disk unopened within 30 days and we'll refund your money.

SPELLSYS $29.95 ppd. in US & Can
Other Foreign add $5.00
Requires 32K CP/M*
Formats: 8" SS SD or
5" SS DD for KayPro, Xerox, Osborne, Morrow, Superbrain.

*CP/M is a trademark of Digital Research

micragraup

P.O. Box 65 Bend, OR 97709
MC (503) 382-8048 Visa

Especially For The Big Board

(503) 382-8048

USERS DISK #1
1-Two fast disk copiers
2-The manual for Small C+
3-Crowe Z80 Assembler
4-Two disk formatters
5-Modem7
6-Othello
7-Serial print routine-Port B

USERS DISK #2
1-Two single disk drive copy programs, both with source
2-Crowe Z80 Assembler source
3-New Crowe.COM file, debugged version
4-New CBIOS with parallel print driver & other extensions for CP/M 1.4 & 2.2
5-Disk mapper with source

USERS DISK #3
1-EPROM burning software for BB I
2-Reset bit 7 (unWordStar a file)
3-Disk file CRC checker
4-New fast copy program & source
5-DU77, disk inspector/editor
6-FINDBAD, isolates bad disk sectors
7-Print fancy page headings

USERS DISK #4
1-CBIOS, custom bios for Tandon drives
2-ZCPR, dynamite CCP checks drive A for missing .COM files; improved commands
3-ZCPRBLOC, identifies CCP location

USERS DISK #5
1-CAT, disk cataloging routines
2-Modem7 for Port A
3-Modem7 for Port B
4-PACMAN, the arcade game
5-FAST, buffers the disk to speed up assemblies
6-NOLOCK, removes BB I shift lock
7-VERIFY, cleanup & verify a flaky disk
8-DUMPX, enhanced for BB I
9-UNLOAD, create .HEX file from .COM file

USERS DISK #6
1-REZ, 8080/Z80 disassembler, TDL mnemonics
2-PRINTPRN, prints Crowe listings
3-RUNPAC, run-time utility package for 8080 assembly language programs. Has 51 functions. Includes source which assembles under ASM.

USERS DISK #7
1-CHNGPFM, PFM monitor mods
2-TERM, terminal routines let you set up BB as simple terminal, as a file receiver, or as a file sender.
3-Checkbook balancing package
4-Disk Utilities - copy to memory, from memory, and dump.

USERS DISK #8
1-BDSCIO, custom BDSC I/O for BB I (both .h and .c)
2-YAM, Yet Another Modem program in source & .COM form. Turns BB into paging intelligent terminal, complete with printer interface, baud rates to 9600.
3-ROFF, text formatter
4-SIGNS, prints large block letters

USERS DISK #9
1-ADVENTURE, expanded 550 pt version
2-Keyboard translation program
3-CBIOS, serial & parallel printer interface
4-EPROM programming package for BB II, for 2732s only

USERS DISK #10 - Lots of Disk Utilities
1-REBOOT, sets up the CP/M auto load
2-SWEEP, directory/file transfer routine
3-A, Lets BB I recognize a double sided drive as one drive with 494K of usable space
4-FIX, super disk utility, does everything, much easier to use than DU77
5-Compare files routine
6-UNERA, retrieve erased files
7-FIND, check all drives on system for a file
8-MENU, menu program for CP/M
9-NEWCAT, enhanced disk catalog program
10-Single drive copy program that does track by track copies rather than file by file
11-Extended CRC checker, creates file & checks file
12-Super disk formatter program for BB I

USERS DISK #11 - Printer Utilities
1-Microline 92 printer routine
2-Graphics display package for MX-80 with Graftrax, very fancy
3-Epson MX80 setup for BB I with 59.5K CP/M
4-Epson MX8 setup for any CP/M, lets you set print modes.
5-Micro Tek print driver, Ports A & B

USERS DISK #12 - Games for BB I
1-ALIENS, a fast, exciting arcade game
2-ZCHESS, chess with a 1-6 level look ahead
3-MasterMind, match wits with the computer
4-BIO, Biorythm charts complete with graphics on the BB I
5-LIFE, so fast it's real animation!
6-CRAPS, see how much you'd lose in Vegas
7-WUMPUS, a caver's delight, kill the Wumpus or be killed
8-PRESSUP, similar to Othello
9-Games, 7 games in one program, includes blackjack, maze, and animal

All Users Disks .....$15.00 each (US,Can,Mex) .....$20.00 each (other foreign)
All The Users Disks Contain Documentation On Disk In .DOC Files.

OTHER GOODIES

Screen Editor in Small C $39.00 $44.00
A simple but full-function screen text editor plus a text formatter, all written in Small C by Edward Ream. This package includes the editor and formatter .COM files setup for the Big Board, Small C itself, and source code for all. With the documentation this is over 400K on a flippy disk. Edward is selling this package for $50, you can buy it from us for $39 (and Ed gets a royalty). Where else can you get an editor, a formatter, a C compiler, and source for all, for under $40?

FREE Your choice of a user's disk or the deluxe character ROM free if you send an article or software and a ROM or extra disk.

US,CAN,MEX Other Foreign

Your Fortune in the Microcomputer Business $26.45 $36.45
This is the best, most complete collection of "working for yourself" information I've found (and I've heard nothing but good comments from those who have received it). This two-volume set is a perfect for those blustery fall evenings when you snuggle up in front of the fire and dream of great riches.

MORE ROMS
Fast monitor ROMs for speed freaks and our famous 'better than Texas' character ROM (V2.3) for screen freaks.
Fast Monitor ROM $25.00 $30.00
Version 2.3 Char ROM $25.00 $30.00

- Send Big Board number with ROM orders.
- Monitor & char. ROMs $5.00 each if you send a fast ROM and a stamped, self-addressed return envelope.

MICRO CORNUCOPIA • P.O. Box 223 • Bend, Oregon • 97709

From Micro Cornucopia

USERS DISK #13 - General Utilities, BB I

1-ZZSOURCE, disassembles to real Zilog mnemonics
2-EX14, superset of submit or supersub
3-MOVPATCH, lets you use MOVECPM on other copies of CP/M
4-XMON, 3K expanded BB I monitor, use in ROM or as overlay
5-CURSOR, prompts you for cursor char you want
6-UMPIRE, very fancy RAM test
7-ZSIDFIX, display improvement for ZSID
8-PIPPAT, modify PIP so you can reset system from within PIP
9-@, Lets you use the BB as a calculator, including HEX
10-SORT, sort package written in C80.

USERS DISK #14 - BB II Software

1-PRO32, latest 2732 reader & programmer
2-SMODEM2, lets BB II talk to Hayes Smartmodem
3-GRAFDEMO, demonstrates BB II graphics (in BASIC)
4-ATTRTEST, demonstrates BB II graphics (in JRT Pascal)
5-INITSIO, initializes port B for 300 or 1200 baud
6-MENU, displays menu of .COM files, enter number to run file
7-SETCLK, sets realtime clock built into BB II
8-PRINT2, modified print which accesses BB II clock
9-BOX, draws a thin line box on screen determined by HL and BC
10-ALIENS, space invaders arcade game
11-LISTSET, printer interface, auto-enables RTS, ignores DCD.

USERS DISK #15 - Word Processing

1-EDIT, very fancy line editor which almost looks identical to EX (Unix). Includes help menu, programmable key, and full manual on disk
2-TED, simple minded line editor, easy to learn & use. Very fast.
3-TTYPE, typing training program written in BASIC
4-TINYPLAN, very simple-minded spreadsheet. Whets your appetite for a fancy one.
5-C80 Text Utilities
6-CHOP, cuts off file after N bytes
7-ENTAB, replace spaces with tabs where possible
8-MS, double or triple spaces a file to output
9-RTW, removes trailing spaces from file
10-TRUNC, truncates each line to specified length
11-WRAP, wraps at column 80, plus pretty pretty printing, page #s ...

REMEMBER
FREE Users Disks in exchange
for submitted software or articles

USERS DISK #16 - BB I Modem Software

1-RCPM27, list of U.S. bulletin boards
2-SMODEM, interfaces BB I with Hayes Smartmodem
3-PLINK66, easy to use with non-CP/M host, for port A
4-BBPAT, menu selection of BAUD rate, bits/char, parity, & stop bits
5-MODEM7+, Modem7 plus BBPAT, lets you talk to anything from port A

USERS DISK #17 - Small C version 2

SMALLC2, this substantially expanded version of Small C now includes for, goto, label, switch (case); external declarations; new preprocessor commands; expanded I/O includes redirection; initializers; plus 12 new expressions. The I/O and runtime libraries have been greatly expanded (including printf). Source & documentation on one full disk.

USERS DISK #18 - FORTH

IFORTH, this is Idaho FORTH which can be burned into ROM or loaded from disk. It replaces the PFM monitor & handles all the monitor functions. See issue #11 FORTH column for more info about IFORTH and this disk.

ANNOUNCING

NINE

!!! NEW !!!

USERS

DISKS

All Users Disks .....$15.00 each (US,Can,Mex) .....$20.00 each (other foreign)
All The Users Disks Contain Documentation On Disk In .DOC Files.

BACK ISSUES

$3.00 each US,CAN,MEX
$5.00 each Other Foreign

ISSUE NO. 1 (8/81)
Power Supply
RAM Protection
Video Wiggle
½ PFM.PRN
16 pages

ISSUE NO. 2((10/81)
Parallel Print Driver
Drive Motor Control
Shugart Jumpers
Program Storage Above PFM
½ PFM.PRN
16 pages

ISSUE NO. 3 (12/81)
4 MHz Mods
Configuring Modem 7
Safer Formatter
Reverse Video Cursor
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16 pages

ISSUE NO. 4 (2/82)
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Modems, Lync, and SIOs
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Two Text Editors
Double Density Review
Scribble, a Formatter
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BB II EPROM Program
Relocating Your CP/M
Serial Print Driver
Big Board I Fixes
Bringing Up WordStar
Cheap RAM Disk
32 pages

ISSUE NO. 10 (2/83)
Saving a Flaky Disk
Hooking Wini to BB II
The Disk Inspector
JRT Fix
Serial Keyboard Interface
Pascal Procedures begins
36 pages

ISSUE NO. 11 (4/83)
BB I Expansions
BB II Details
Dyna, RAM Disk Review
Easier Reverse Video Cursor
PlannerCalc Review
KayPro Column begins
36 pages

TWO WAYS TO ENHANCE YOUR BIGBOARD'S CAPABILITIES:

#1 DUAL DENSITY

HARDWARE

- A daughter board that plugs into the 1771 socket. With this board the system employs automatic density select.
- You can run 5¼" drives by following the simple steps outlined in the manual. A 50-34 pin disk drive adapter board is included with 5¼" orders.

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- Choose 2.5 MHz or 4 MHz software, for 5¼" or 8" drives. Also select software for single or for double-sided drives.
- 8" users have up to 674k bytes of user storage per disk (per side). 5¼" users have up to 185k bytes of user storage per disk (per side).
- Dual Density software includes:

- DDINIT. COM: a double density disk initialization and verification program. Options:
  - 8 formats.
  - Format an entire disk or just system tracks.
  - Selection of sector skew.
  - Option to verify.
  - Choice of drive to be used.
  - Has a default which chooses the format that gives the most disk space.
- DDSYSGEN. COM: a double density sysgen program with three options:
  1) Read double density system tracks into memory.
  2) Write double density system tracks from memory to a double density disk.
  3) Generate a double density system disk complete with printer driver. This process uses your single density CP/M disk, the SWP distribution disk, and a blank disk. Five serial printer drivers and a parallel driver are included, and there is an option to install a user-written driver. All drivers can be modified.
- DDCOPY. COM: a double density copy program that copies all files from a source disk to a destination disk.

- Being a dual density system, the computer automatically distinguishes between single and double density disks. Densities may be mixed.

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#2 CO-POWER-88+

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SOFTWARE

- Runs CP/M-86 or MSDOS. CP/M-86 is compatible with CP/M 2.2. Its command files have .CMD as the extent, making it possible for CP/M-86 and CP/M 2.2 files to co-exist on the same disk (CP/M 2.2 command files have .COM as the extent). MSDOS is the operating system of the IBM-PC. IBM-PC MSDOS programs are compatible with the CO-POWER-88 MSDOS.
- Simple commands move the user between the Z80|CP/M2.2 system and the 8088|CP/M-86, MSDOS system.
- The RAM of CO-POWER-88 can be used as a "memory" ("M") disk drive for CP/M 2.2. Programs can be compiled in M, then saved to disk, decreasing job time by avoiding disk access time.

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*64k CO-POWER-88	$ 699.95
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MSDOS for CO-POWER-88	—CALL—

*Add-on RAM cards are available. Call.

+CO-POWER-88 is available for nearly all Z80 or 8080 computers using CP/M 2.2.

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On Your Own

Column by David Thompson

This time we're covering a most important topic for those of you doing your own thing—getting something out the door. The next column will be on Hampton Miller's experiences as he begins his own consulting business. (You'll have a chance to talk to Hampton in person at the Get Together.)

Dear Editor

"I have an inexpensive 300-baud modem board. If I ever get the time, I will send in an article about it and even offer kits for sale."

Daniel Lang
24661 W Passavant
Round Lake, IL 60073

This note really hit me because this is exactly why many of us don't ever get out on our own—and why many of those of us who do, are often forced to go back to the sweatshops.

The problem is that we get something almost done, almost ready, almost available, almost documented, almost publicized. There is always that last hump to get over before something is really finished.

Daniel has already done a lot of things right. He's got a product a lot of people are interested in, he can make it available in kit form which is perfect for the Micro C group, and it's not a big item so he can stock a few sets of parts without going into hock. He can get free publicity by writing an article about it (and ads in Micro C are very inexpensive). (In fact, if you are interested in his modem, write to him.)

What usually happens

Often, a new project comes along that looks bigger and better (or at least more interesting) than the present one. So you drop what you're doing and move on. You're never going to sell anything that isn't finished (unless you are a major corporation), and you aren't going to sell anything to folks who don't know you have something to sell.

I can count on 10 hands and 10 feet all the times I've invested time in a project that I didn't finish. Usually the problem was that I became too busy on another (and later equally unfinished) project. I can count on one hand all the projects that I have actually finished and tried marketing, and I can count on that same hand all the successful projects.

In fact, once my projects started being successful, my completion rate went to nearly 100% and the success rate went way up too.

Complete, complete, complete

I can't overemphasize the importance of completing something—really giving it your best shot—and then covering your eyes and holding it out to see if someone grabs it.

If folks don't grab it, despite a good presentation to an appropriate audience (audience and presentation are books unto themselves), then it's time to tackle a new project. But, look at the new project carefully. Use the knowledge you gained from the unsuccessful project when you make your next selection.

Take full advantage of the flop. Find some folks who are successful in the field; show them what you did, how you marketed it, and to whom. I've seen beautiful products that wouldn't sell because the ads, the literature, and the documentation were absolutely horrid. The printed materials were afterthoughts for the designer but they were the purchaser's only impression of the product. Your product is not ready to go out the door until it is well documented and well displayed.

Talk to the people who might purchase this item. Do they want it? Will they want it in a year? How large is the audience. Is the audience easy to reach? Is there any competition? How and where is the competition advertising.

Your second product also may not fly, but it should do better than the first. If not, and the third time isn't the charm either, then you probably ought to try another stint in the mines.

What sells

There about probably 6,000 to 8,000—perhaps more—Big Board I's loose out there waiting to gobble up anything that looks interesting. Some VERY useful things have remained ungobbled (AB computers Microtime 80 and LA Software's XLT translator) while others have really been slurped up (AZTEC CII, Software Publishers dual density, the $10 disk controller from Phenix, and the new Dyna disk).

The ECRL board really met a need; Tom just didn't ship them—and now, I understand, the whole "company" has disappeared. If you are interested in designing a new board for the BB I, you might still do very well redoing that one. I recall Tom Brandt, the sole proprietor of ECRL, mentioning to me that orders were running better than $100,000 per month. Many of those were initial orders from outfits who would have based new systems on the combination of the Big Board I and the ECRL board.

If you are designing a product either for the BB I or II, or for the general CP/M market, you should consider a display ad in Micro C. A sixth of a page is only $40 and the ad works for a long time. We are keeping all the issues of Micro C in print, (we have reprinted issue #1 three times already). So there's no cheaper way to test the waters if you are after a sophisticated audience.

Competition

Obviously, if two or three folks are already supplying your product to the Big Board market, then you ought to look for another product or another market. But if you are aiming at a larger market it's a different story.

If Non Linear had given up because Osborne hit the market so fast and hard, they wouldn't now be selling 10,000 KayPros a month. The portable computer market is huge and growing rapidly.

I don't have to tell you how many of the rest of us thought about building a portable BB I. You could still do it and do it successfully if you researched the market carefully and added the appropriate new bells and whistles. However, you'd better have a couple of million bucks in your pocket before you start.

So

Pick your project carefully. You need to know early: who will finance it, who will design it, who will document it, who will publicize it, who will buy it, who will build it, and how do you reach the buyer? And once you know all these things, remember—that if it doesn't get out the door, then none of the above really matters. ■ ■ ■

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TECHNICAL TIPS

Burning 2716s on the BB II.

The following will let you program 2716s on the BB II without modifying the board.

Doug Durland's article in issue #10 pointed out the problems the BB II has programming the 2716. Pin 21 does need to remain at +5V during a read operation. Jumper pin 21 to WR/not *(Ed. note: appears to be from U-42 pin 9)* which will always be high during chip reads. If the program reads the 2716 with pin 21 jumpered to WR/not and then waits for you to change the jumper to the OE/VPP line, then everything should work fine. You can use a similar compare algorithm to determine if a byte should be programmed to be skipped but in this case the comparison must take place between the RAM image of the ROM and the new data.

Doug also mentioned that the 2716 needs to see a low to high transition on the chip enable pin. He said that it is difficult to guarantee that RCE/not will stay low during address changes. We agree. However, RCE/not can stay high during address changes. If we disable all REC/not lines before writing each new data byte, we can then drop RCE/not, raise it for 50ms, and then go to the next address. It is this low to high transition with VPP present that programs the 2716.

I make these comments because I don't like hardware modifications unless they are absolutely necessary. For just a couple of 2716s I wouldn't modify the board. And, if I were doing production runs on 2716s, I'd set up the prom programmer to burn 5 chips at a time using the PGM/not line. (This line is common to all 6 sockets and can be used in place of the RCE/not line to pulse pin 18 of several chips at a time.)

Note that we made MOM of PROM configurable so that without re-assembling etc. you can read or burn any EPROM that can be physically handled by the Big Board II. In fact, with an external adapter you can handle any EPROM up to 256K.

Cindy Hollenbeck
Industrial Software
19623 Autumn Creek
Humble, TX 77346

Head Load Pads

For those of you wanting to follow the drive maintenance article in issue # 8 by replacing your Shugart SA800/801's head load pads but not wanting to buy a whole package of pads (probably 100 per pack for $25.00) you can make them out of scrap felt.

I found some fairly dense felt and a leather punch and made little circles about 1/8" diameter and 1/8" thick. I reduced these to 1/16" thick (thickness is critical; if they're too thick you get bad sectors too) and rounded the edges slightly. Then I removed the plastic pad assembly from the head load arm (don't lift the arm too high), scraped off the old pad and used cyano-acrylate glue (any good glue should do as long as it doesn't impregnate the felt) to install the new pads.

Bad sectors went from 1 per 8 hours computing to 1 per 48 hours computing and I use some Wabash disks.

Andy Robinson,
73 Conroy Cres. #102
Guelph, Ont. CANADA
N1G 2V5

Cutting Restores

I noticed my drives (Siemens FDD200-8) were doing random restores to track 0 during file I/O. I lowered the step but that didn't help. However the problem stopped when I made a patch to PFM.

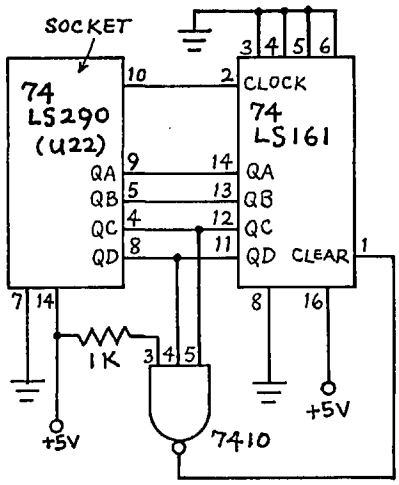
At F7A5 there is a time delay which takes 44 microseconds. By lengthening this delay, I cured the problem.

```
Change:
F7A5 from CD A8 F7 to CD E6 F7
                        ;Call new pause

Add:
F7E6 C5          ;PUSH BC
F7E7 06 20       ;LD B 20H
F7E9 10 FE       ;DJNZ (to F7E9)
F7EB C1          ;POP BC
F7EC C9          ;RET

This little routine takes 184 micro
seconds at 2.5 MHz.
```

Bob Felton
4803 Neblina Dr
Carlsbad, CA 92008



Simple 50 Hz video mod

Using the BB I (and KayPro) in countries with 50 Hz mains is a problem because of the jittery screen (caused by the beat between the 60 Hz vertical and the power).

Fortunately you can slow the vertical to 50 Hz without cutting foils or changing the video crystal. Just slow down the vertical timing for 50 Hz by having the scan counter (U22) divide by 12 instead of 10. You can do this by replacing U22 with a small piggyback board containing U22 (74LS290), plus a 74LS161 and a 7410.

Uwe Pitz
Hauptstr.36 3180 Wolfsburg 29
West Germany

Editor's note:

It appears to me that the only lines you bring up from U22's socket are those marked (as pins) on the 74LS290 (and you bring up the same pin numbers that are marked). Then you tie the 74LS161 and the 7410 to the appropriate pins on the LS290.

Big Board Bulletin Boards

Twin Cities 612-432-0428
24 hrs, 300 & 1200 baud
Chris Torkildson
13791 Heywood Ct
Apple Valley, Mn 55124

There are two other BB bulletin boards, that I'm aware of (though I'm sure there are more). Both run by authors who have articles in this issue.

See the BB I article by Trevor Marshall and the BB II article by Brett Berg for more information. Both are 24 hours, and I know that Trevor's handles both 300 and 1200 baud.

THE CONTINUING ADVENTURES OF Bugsbury

by Gary Whitley

Career Opportunities For Your Software Bug...

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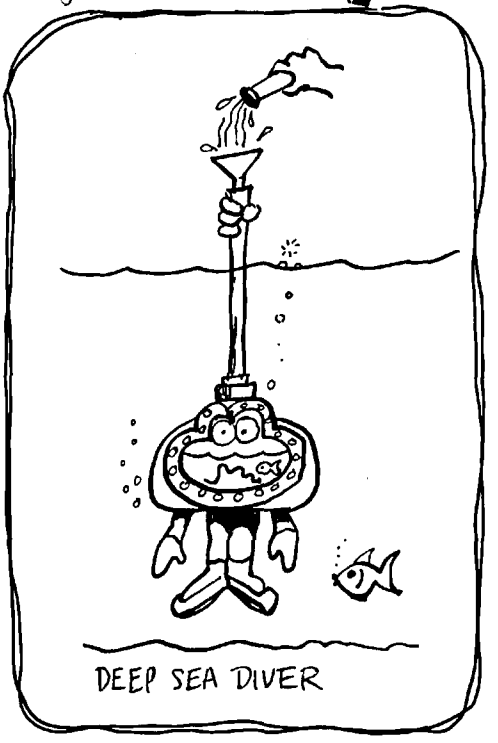

DEEP SEA DIVER

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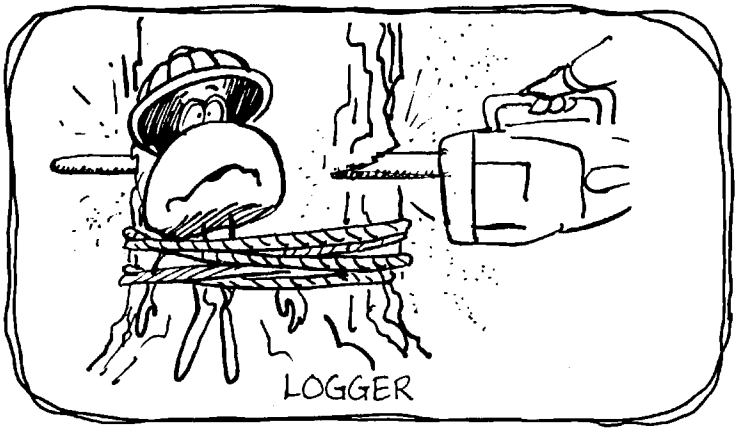
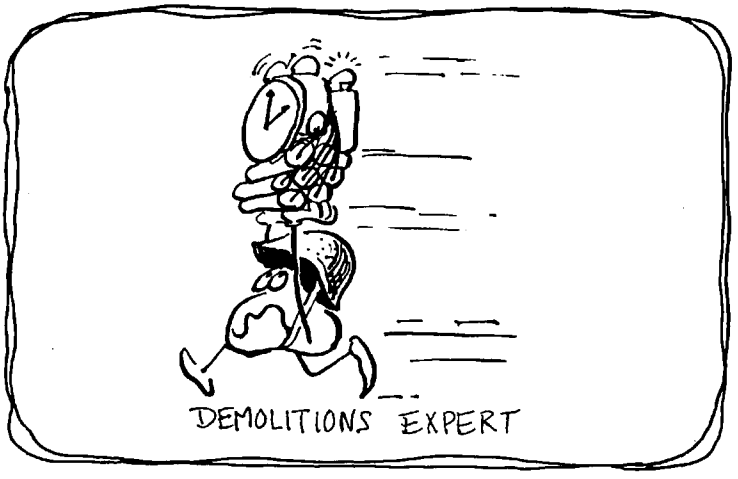
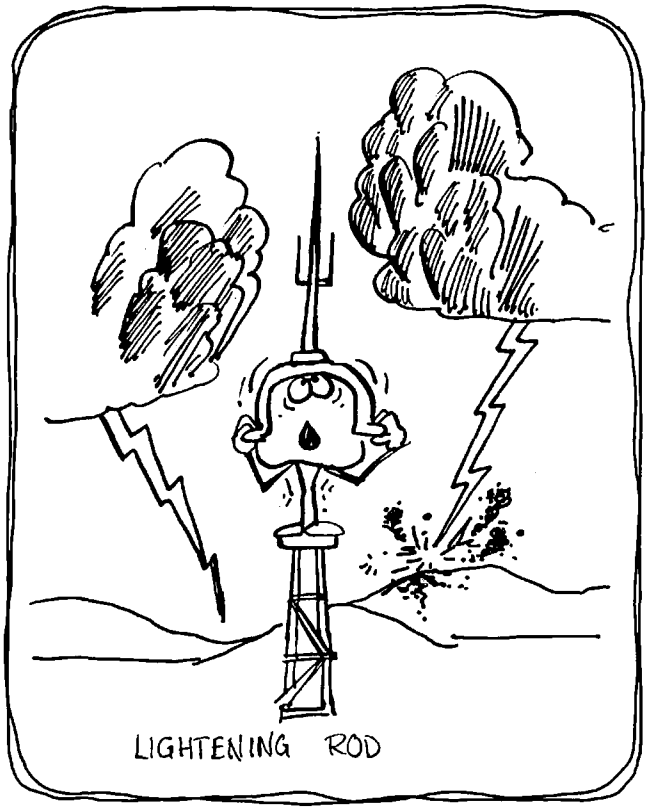


LOGGER



DEMOLITIONS EXPERT



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5-Modem7
6-Othello
7-Serial print routine-Port B

USERS DISK #2
1-Two single disk drive copy programs, both with source
2-Crowe Z80 Assembler source
3-New Crowe.COM file, debugged version
4-New CBIOS with parallel print driver & other extensions for CP/M 1.4 & 2.2
5-Disk mapper with source

USERS DISK #3
1-EPROM burning software for BB I
2-Reset bit 7 (unWordStar a file)
3-Disk file CRC checker
4-New fast copy program & source
5-DU77, disk inspector/editor
6-FINDBAD, isolates bad disk sectors
7-Print fancy page headings

USERS DISK #4
1-CBIOS, custom bios for Tandon drives
2-ZCPR, dynamite CCP checks drive A for missing .COM files; improved commands
3-ZCPRBLOC, identifies CCP location

USERS DISK #5
1-CAT, disk cataloging routines
2-Modem7 for Port A
3-Modem7 for Port B
4-PACMAN, the arcade game
5-FAST, buffers the disk to speed up assemblies
6-NOLOCK, removes BB I shift lock
7-VERIFY, cleanup & verify a flaky disk
8-DUMPX, enhanced for BB I
9-UNLOAD, create .HEX file from .COM file

USERS DISK #6
1-REZ, 8080/Z80 disassembler, TDL mnemonics
2-PRINTPRN, prints Crowe listings
3-RUNPAC, run-time utility package for 8080 assembly language programs. Has 51 functions. Includes source which assembles under ASM.

USERS DISK #7
1-CHNGPFM, PFM monitor mods
2-TERM, terminal routines let you set up BB as simple terminal, as a file receiver, or as a file sender.
3-Checkbook balancing package
4-Disk Utilities - copy to memory, from memory, and dump.

USERS DISK #8
1-BDSCIO, custom BDSC I/O for BB I (both .h and .c)
2-YAM, Yet Another Modem program in source & .COM form. Turns BB into paging intelligent terminal, complete with printer interface, baud rates to 9600.
3-ROFF, text formatter
4-SIGNS, prints large block letters

USERS DISK #9
1-ADVENTURE, expanded 550 pt version
2-Keyboard translation program
3-CBIOS, serial & parallel printer interface
4-EPROM programming package for BB II, for 2732s only

USERS DISK #10 - Lots of Disk Utilities
1-REBOOT, sets up the CP/M auto load
2-SWEEP, directory/file transfer routine
3-A, Lets BB I recognize a double sided drive as one drive with 494K of usable space
4-FIX, super disk utility, does everything, much easier to use than DU77
5-Compare files routine
6-UNERA, retrieve erased files
7-FIND, check all drives on system for a file
8-MENU, menu program for CP/M
9-NEWCAT, enhanced disk catalog program
10-Single drive copy program that does track by track copies rather than file by file
11-Extended CRC checker, creates file & checks file
12-Super disk formatter program for BB I

USERS DISK #11 - Printer Utilities
1-Microline 92 printer routine
2-Graphics display package for MX-80 with Graftrax, very fancy
3-Epson MX80 setup for BB I with 59.5K CP/M
4-Epson MX8 setup for any CP/M, lets you set print modes.
5-Micro Tek print driver, Ports A & B

USERS DISK #12 - Games for BB I
1-ALIENS, a fast, exciting arcade game
2-ZCHESS, chess with a 1-6 level look ahead
3-MasterMind, match wits with the computer
4-BIO, Biorythm charts complete with graphics on the BB I
5-LIFE, so fast it's real animation!
6-CRAPS, see how much you'd lose in Vegas
7-WUMPUS, a caver's delight, kill the Wumpus or be killed
8-PRESSUP, similar to Othello
9-Games, 7 games in one program, includes blackjack, maze, and animal

USERS DISK #13 - General Utilities, BB I
1-ZZSOURCE, disassembles to real Zilog mnemonics
2-EX14, superset of submit or supersub
3-MOVPATCH, lets you use MOVECPM on other copies of CP/M
4-XMON, 3K expanded BB I monitor, use in ROM or as overlay
5-CURSOR, prompts you for cursor char you want
6-UMPIRE, very fancy RAM test
7-ZSIDFIX, display improvement for ZSID
8-PIPPAT, modify PIP so you can reset system from within PIP
9-@, Lets you use the BB as a calculator, including HEX
10-SORT, sort package written in C80.

USERS DISK #14 - BB II Software
1-PRO32, latest 2732 reader & programmer
2-SMODEM2, lets BB II talk to Hayes Smartmodem
3-GRAFDEMO, demonstrates BB II graphics (in BASIC)
4-ATTRTEST, demonstrates BB II graphics (in JRT Pascal)
5-INITSIO, initializes port B for 300 or 1200 baud
6-MENU, displays menu of .COM files, enter number to run file
7-SETCLK, sets realtime clock built into BB II
8-PRINT2, modified print which accesses BB II clock
9-BOX, draws a thin line box on screen determined by HL and BC
10-ALIENS, space invaders arcade game
11-LISTSET, printer interface, auto-enables RTS, ignores DCD.

USERS DISK #15 - Word Processing
1-EDIT, very fancy line editor which almost looks identical to EX (Unix). Includes help menu, programmable key, and full manual on disk
2-TED, simple minded line editor, easy to learn & use. Very fast.
3-TTYPE, typing training program written in BASIC
4-TINYPLAN, very simple-minded spreadsheet. Whets your appetite for a fancy one.
5-C80 Text Utilities
6-CHOP, cuts off file after N bytes
7-ENTAB, replace spaces with tabs where possible
8-MS, double or triple spaces a file to output
9-RTW, removes trailing spaces from file
10-TRUNC, truncates each line to specified length
11-WRAP, wraps at column 80, plus pretty pretty printing, page #s ...

USERS DISK #16 - BB I Modem Software
1-RCPM27, list of U.S. bulletin boards
2-SMODEM, interfaces BB I with Hayes Smartmodem
3-PLINK66, easy to use with non-CP/M host, for port A
4-BBPAT, menu selection of BAUD rate, bits/char, parity, & stop bits
5-MODEM7+, Modem7 plus BBPAT, lets you talk to anything from port A

USERS DISK #17 - Small C version 2
SMALLC2, this substantially expanded version of Small C now includes for, goto, label, switch (case); external declarations; new preprocessor commands; expanded I/O includes redirection; initializers; plus 12 new expressions. The I/O and runtime libraries have been greatly expanded (including printf). Source & documentation on one full disk.

USERS DISK #18 - FORTH
IFORTH, this is Idaho FORTH which can be burned into ROM or loaded from disk. It replaces the PFM monitor & handles all the monitor functions. See issue #11 FORTH column for more info about IFORTH and this disk.

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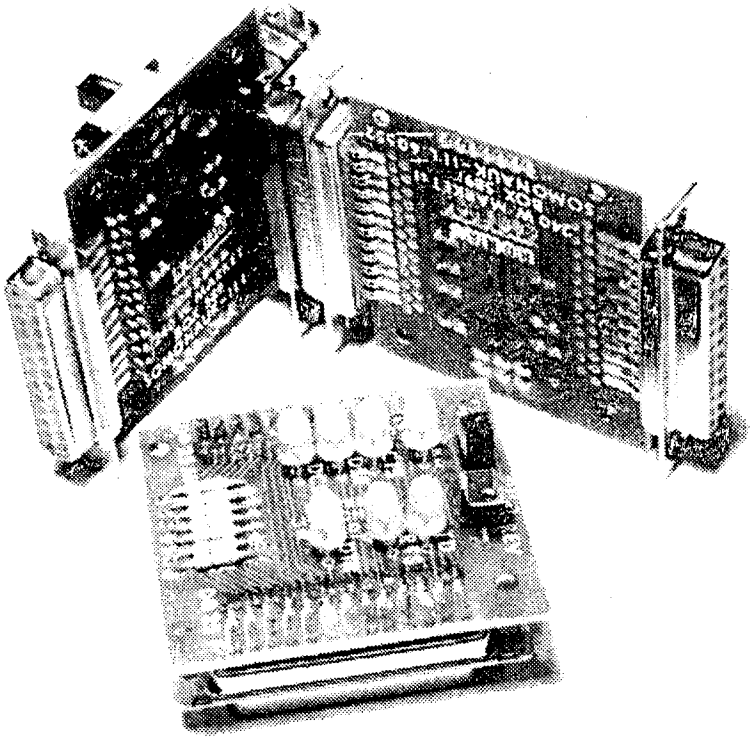

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